Overview of Trends in Canadian mineral exploration

CANADIAN INTERGOVERNMENTAL WORKING GROUP ON THE MINERAL INDUSTRY

2002

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Canadian mineral exploration

Canadian Intergovernmental Working Group
on the Mineral Industry

2002

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The cover photo shows barge-mounted diamond drilling of the Central Porphyry Zone project of the Porcupine Joint Venture, managed by Placer Dome (CLA) Ltd. (51%) and Kinross Gold Corporation (49%). The barge is on Pearl Lake, within the City of Timmins, Ontario, with the historic headframe of the No. 11 shaft of the McIntyre gold-copper mine in the background (production of 10.8 million ounces of gold between 1912 and 1988). The drilling by Benoit Diamond Drilling Ltd. is part of an advanced exploration project for quartz vein-hosted, high-grade gold mineralization within the Pearl Lake Porphyry.

Preface

This report is prepared annually, on behalf of the Intergovernmental Working Group on the Mineral Industry (IGWG), for presentation to federal, provincial and territorial mines ministers. It contains information, current as of October 2002, on recent exploration and deposit appraisal spending levels in Canada, a review of exploration and deposit appraisal activities in the provinces and territories, and analyses of domestic and international trends affecting the Canadian mineral exploration sector.

The analyses, articles and reviews found in this report were prepared by officials from respective provincial/territorial departments responsible for mineral exploration and from Natural Resources Canada (NRCan). The Minerals and Metals Sector of NRCan was responsible for compiling, editing, producing and distributing this report, which covers exploration and deposit appraisal activities for metallic minerals, nonmetallic minerals, coal and uranium. It does not refer to petroleum-related work.

The report can be accessed via the Minerals and Metals Sector's home page on the Internet at www.nrcan.gc.ca/mms/pubs/explor_e.htm.

NOTE TO READERS

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For further information on specific issues related to this report (i.e., exploration activities, incentives and programs, rules and regulations, geoscientific data, etc.), the reader is invited to contact the appropriate federal, provincial or territorial authorities at the telephone numbers listed below or to consult their respective web sites. The contact information for officials who prepared the provincial/territorial sections are also provided at the beginning of each of these sections while the NRCan officials who participated in the preparation of this report are listed below. Prince Edward Island is not included because of a current lack of mineral exploration activity.

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Executive Summary

Statistics from the federal-provincial/territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures show that all-inclusive exploration and deposit appraisal spending has at least stabilized in recent years after declining significantly from the 1997 peak of $921 million to a low of $497 million in 2000. Most of that decline occurred in 1998 when expenditures dropped by $265 million (29%) to $656 million. Another significant decline of 23% occurred between 1998 and 1999 when exploration and deposit appraisal expenditures dropped by a further $152 million to $504 million.

While the spending levels recorded in 2000 ($497 million), 2001 ($513 million) and 2002 ($501 million) point at best to a leveling off of the downward trend, evidence collected since the revised intentions survey of August 2002 indicates that Canada may in fact have entered into an upward trend in exploration and deposit appraisal spending. Easier access to financing, a rising gold price and a sustained search for diamonds are all contributing factors to what could turn 2002 into a better year than expected (when the final statistics are released) and 2003 into the year that will confirm the rising trend based on a positive outlook for company spending intentions.

Canada's junior mining sector, which had been particularly affected by the downturn that began after 1997, has recovered nicely, registering a fourth consecutive increase in spending in 2002. The stronger junior sector contributed to higher exploration-phase expenditures (grass-roots exploration) in both 2001 and 2002. In 2001, junior companies accounted for 35% ($178 million) of total exploration and deposit appraisal expenditures in Canada. That proportion rose to 42% ($209 million) in 2002.

While a stronger junior mining sector and an increase in grass-roots exploration are both good news, spending by senior companies has been a cause of concern in recent years. As a group, these companies had been curtailing their exploration and deposit appraisal budgets as a result of the pressure that was put on their balance sheets by weak metal prices. A forecast increase of 44% in on-mine-site spending by senior companies in 2002, to $103 million, should help alleviate concerns about diminishing prospects for outlining and discovering additional ore reserves at existing mines.

A major shift in the traditional distribution of exploration and deposit appraisal funds was confirmed in 2001 when, for the first time ever, diamonds overtook base metals. With expenditures of $145 million on exploration and deposit appraisal, diamonds also came close to surpassing precious metals ($167 million) and becoming the most sought mineral commodity in Canada.

As detailed in the Regional Outlook section of this report, a number of interesting exploration and deposit appraisal projects are currently under way. Canadian governments continue to support and promote exploration and deposit appraisal activities in their respective jurisdictions through various initiatives, including innovative fiscal incentives, the resolution of land access issues, and the provision of state-of-the-art geoscientific data.

Canada ranks second in terms of countries where the world's larger mineral exploration companies are the most active. The larger Canadian companies were expected to undertake 30% of all the exploration programs in the world in 2001, by far the largest share of the global mineral exploration market.

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ABBREVIATIONS

The reader should note that a number of abbreviations for common units of measurement appear in the text:

cm	centimetres
ct	carats
ct/ht	carats per hundred tonnes
ct/t	carats per tonne
ct/y	carats per year
ft	feet
ft^2	square feet
g	grams
g/t	grams per tonne
ha	hectares
kg	kilograms
km	kilometres
km^2	square kilometres
lb	pounds
m	metres
m^2	square metres
Mct	million carats
Mha	million hectares
mm	millimetres
Mt	million tonnes
Mt/y	million tonnes per year
oz	troy ounces
ppm	parts per million
t	tonnes (metric)
t/d	tonnes per day
t/y	tonnes per year
tU	tonnes of uranium

Note: All dollar figures in this report are Canadian unless specified otherwise.

1. Indicators of Mineral Exploration and Deposit Appraisal Activity in Canada

1.1 INTRODUCTION

The first chapter of this report presents data and analysis on indicators of mineral exploration and deposit appraisal activity in Canada. Except where needed for comparing different data sets, it does not cover activities beyond the deposit appraisal stage such as those related to mine development. The most important of the indicators studied in this report is spending and, accordingly, most of the analysis focuses on expenditure trends and patterns. Chapter 1 also provides analysis on two other indicators of exploration and deposit appraisal activity: drilling and claim staking.

The Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures was redesigned in 1997 to provide a more comprehensive breakdown of the mineral development cycle in Canada. This breakdown is based on the generalized model of the resource development and mining process (**Table 26** in Appendix 2). The introduction of new cost categories such as engineering, environment, feasibility studies and land access, and a clearer separation between the different work phases, offer expanded analytical options over the pre-1997 survey format. While the former survey data continue to be used to show some historical trends, the analysis in this report is primarily based on the set of definitions[1] that was adopted in 1997. For a better understanding of these definitions and the redesigned survey, the reader is invited to consult Section 1.2 and Appendix 2.

A further change to the survey methodology was tested and adopted in 2002. The confidence level of the survey of company spending intentions for a given year, which is conducted in the last quarter of the previous year and compiled in January of the forecast year, will be bolstered from now on by a revised survey of spending intentions. This "survey within a survey" will be conducted in the first half of the forecast year and results will be released in July, six months after the spending intentions forecast will have been released. All companies that had reported spending intentions during the latter exercise, as well as those that had failed to do so, will be surveyed again on how close they are at that time from their previously reported spending plans. This new feature will improve the forecast capabilities of the entire survey process and provide more timely information on the actual state of mineral exploration for industry stakeholders and decision-makers at the provincial/territorial and federal levels of government. Results from the first revised intentions survey were released in August 2002 and are presented in this chapter.

1.2 SUMMARY OF SURVEY DEFINITIONS

In the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures, often referred to as the federal-provincial/territorial survey of mining and exploration companies, exploration is defined as the work carried out on- or off-mine-site to search for, discover and carry out the first delineation of a previously unknown mineral deposit to establish its potential economic value (tonnage and grade) and to justify further work. Deposit appraisal, on the other hand, includes the work carried out on- or off-mine-site to bring a delineated deposit to the stage of detailed knowledge required for a production feasibility study.

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[1] A different set of definitions is used in Chapter 3 for international exploration. It is based on data from the Metals Economics Group.

The more detailed cost breakdown of the new survey provides exploration and deposit appraisal expenditures that are generally higher than the ones obtained for the traditional "field work and overhead costs" in the old survey simply because cost categories like engineering, economic and feasibility studies, environment and land access were not previously accounted for. The survey also collects data on capital and repair costs for construction, machinery and equipment for each of the work phases (exploration, deposit appraisal and mine complex development), but these costs will seldom be referred to in this review. The comprehensive coverage offered by all of these categories of expenditures provides a more complete picture of the total investment required to bring projects to the production decision stage.

1.3 EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES

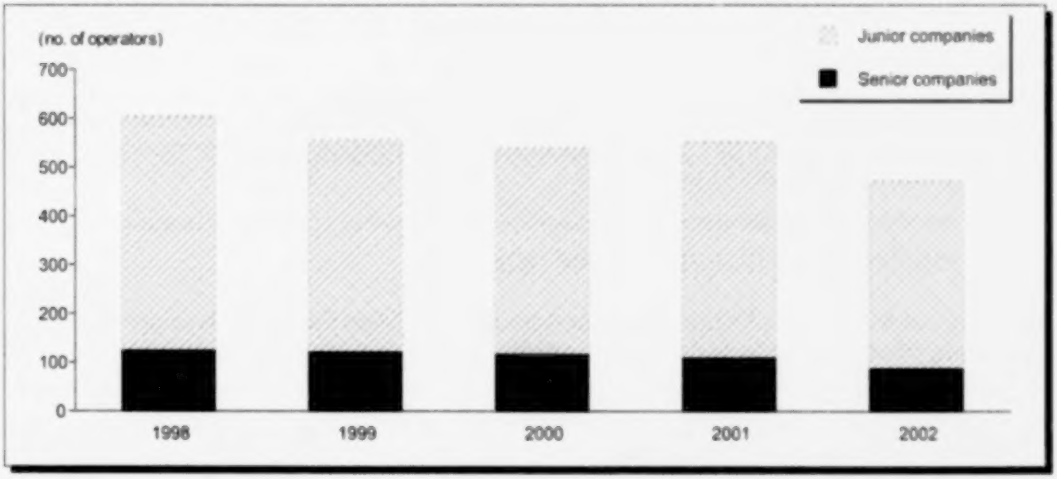
Over the years, levels of exploration and deposit appraisal expenditures have been relied upon to determine the health of Canada's mineral exploration sector and to provide an insight into the future of the country's minerals and metals production capacity. This section focuses on analyzing expenditure data for 2001 and 2002. The data for 2001 are considered to be final. The data for 2002 were compiled in January 2002 and revised in August 2002. They will be finalized in 2003. This section also provides some coverage of the six-year period 1997-2002, which represents the first six years of data for the redesigned survey.

1.3.1 2001 Exploration and Deposit Appraisal Expenditures

1.3.1.1 Statistical Summary

In 2001, 553 companies (project operators) and some prospectors spent $513 million on mineral exploration and deposit appraisal in Canada (**Figure 1**). That number of project operators repre-

Figure 1
Project Operators Active in Exploration and Deposit Appraisal in Canada, 1998-2002



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
Notes: Data include prospectors and prospector groups. Data for 2001 are final; 2002 data are based on company spending intentions as compiled in January 2002 and revised in August 2002.

sented an increase of 2% from the 2000 total of 541 companies (expenditures of $497 million) and a halt to the downward trend observed in recent years. There were 684 project operators in 1997, 604 in 1998 and 557 in 1999. A total of 78 companies (compared to 86 in 2000) spent more than $1 million each in 2001 (**Table 1**); these companies' expenditures accounted for 83% of the total expenditures for that year, almost the same proportion as that of the 86 companies in 2000.

Compared to 2000, spending decreases totaling $30 million were recorded in eight provinces and territories (**Figure 2** and **Table 2**). In dollar terms, none of these declines really stand out. In percentage terms, however, provinces/territories like Alberta (-39%), the Yukon (-31%), Nova Scotia (-21%) and British Columbia (-19%) saw their exploration spending continue on a downward spiral. New Brunswick (-22%) and Saskatchewan (-18%) also experienced decreases compared to 2000 but, when considering the three-year period 1999-2001, spending in these two provinces could be considered fairly stable. Spending increases totaling $46 million were recorded in the Northwest Territories, Québec, Newfoundland and Labrador, and Manitoba. The Northwest Territories experienced the largest increase with a $35 million gain over the previous year. In decreasing order of amounts spent on exploration and deposit appraisal, Ontario, Québec, the Northwest Territories and Nunavut accounted for 71% of all such expenditures in Canada in 2001.

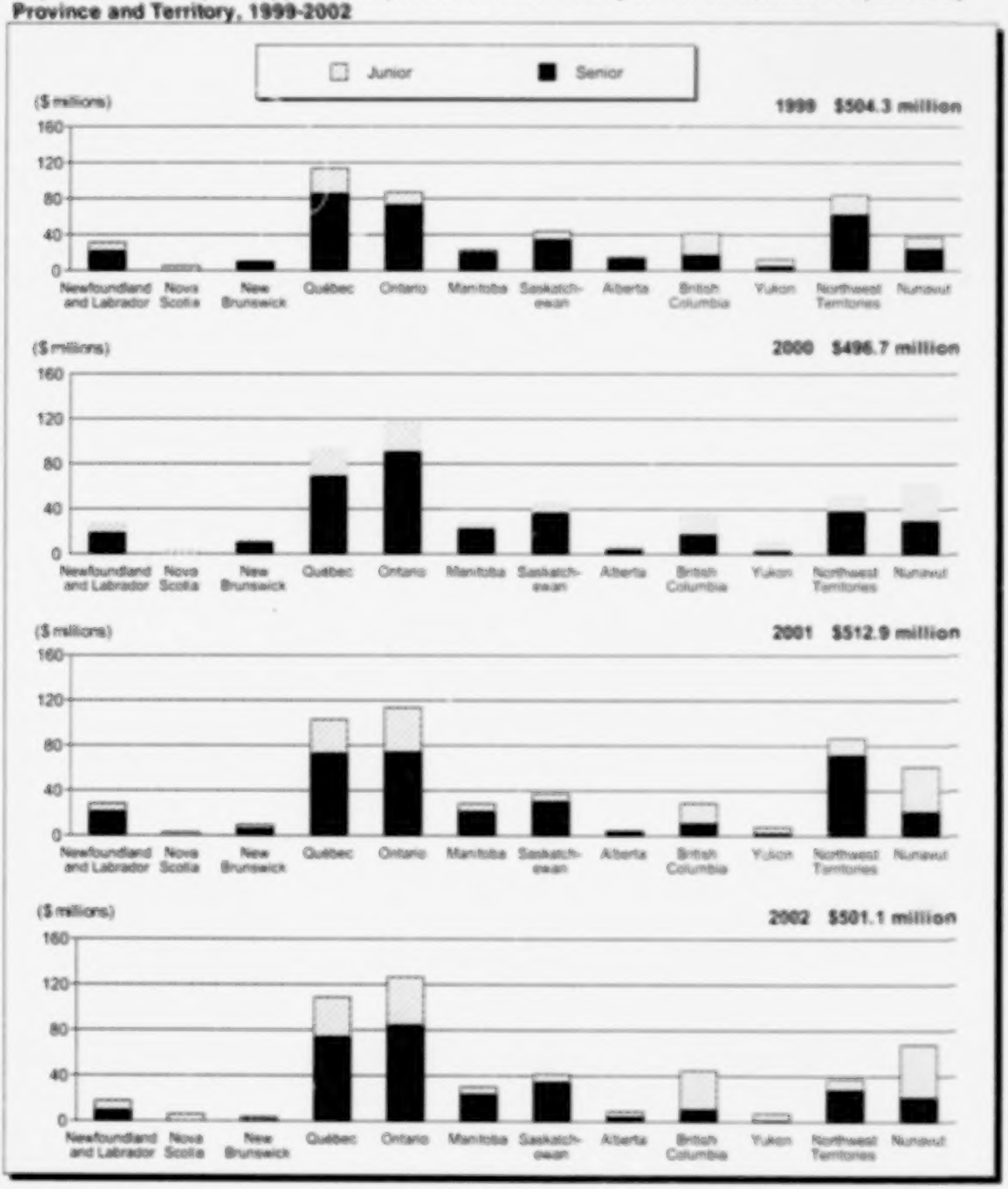
TABLE 1. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES,(1) BY RANGE OF EXPENDITURES AND BY TYPE OF COMPANY, 2000-02

	Junior			Senior			Total		
Range of Expenditures	Companies	Expenditures	Percentage of Total Junior Expenditures	Companies	Expenditures	Percentage of Total Senior Expenditures	Companies	Expenditures	Percentage of Total Expenditures
($)	(number)	($000)	(%)	(number)	($000)	(%)	(number)	($000)	(%)
2000									
>10 million	1	16 697	10.7	8	160 666	47.2	9	177 363	35.7
5 million-10 million	1	5 678	3.6	16	112 933	33.1	17	118 611	23.9
1 million-5 million	34	67 998	43.6	26	53 380	15.7	60	121 378	24.4
500 000-1 million	35	24 328	15.6	12	8 254	2.4	47	32 582	6.6
200 000-500 000	73	24 039	15.4	7	2 184	0.6	80	26 222	5.3
100 000-200 000	59	8 280	5.3	14	2 080	0.6	73	10 359	2.1
50 000-100 000	48	3 368	2.2	12	887	0.3	60	4 255	0.9
1-50 000	141	2 522	1.6	22	304	0.1	163	2 826	0.6
Subtotal	392	152 909	98.0	117	340 689	100.0	509	493 598	99.4
Prospectors (2)	32	3 053	2.0	–	–	–	32	3 053	0.6
Total 2000	424	155 962	100.0	117	340 689	100.0	541	496 651	100.0
2001									
>10 million	1	14 336	8.1	11	222 969	66.5	12	237 305	46.3
5 million-10 million	4	28 571	16.1	9	60 863	18.2	13	89 434	17.4
1 million-5 million	34	62 821	35.3	19	37 525	11.2	53	100 346	19.6
500 000-1 million	42	28 921	16.3	9	6 494	1.9	51	35 416	6.9
200 000-500 000	72	23 103	13.0	9	3 046	0.9	81	26 150	5.1
100 000-200 000	73	10 411	5.9	24	3 629	1.1	97	14 040	2.7
50 000-100 000	57	4 027	2.3	4	274	0.1	61	4 301	0.8
1-50 000	122	2 052	1.2	25	405	0.1	147	2 458	0.5
Subtotal	405	174 243	98.0	110	335 136	100.0	515	509 379	99.3
Prospectors (2)	38	3 490	2.0	–	–	–	38	3 490	0.7
Total 2001	443	177 733	100.0	110	335 136	100.0	553	512 869	100.0
2002									
>10 million	–	–	–	8	159 141	54.5	8	159 141	31.8
5 million-10 million	5	35 491	17.0	9	62 008	21.3	13	97 499	19.5
1 million-5 million	44	100 634	48.1	22	61 042	20.9	66	161 676	32.3
500 000-1 million	48	31 450	15.0	7	4 100	1.4	55	35 550	7.1
200 000-500 000	89	27 413	13.1	12	3 455	1.2	101	30 868	6.2
100 000-200 000	52	6 749	3.2	10	1 301	0.4	62	8 049	1.6
50 000-100 000	35	2 122	1.0	8	505	0.2	43	2 627	0.5
1-50 000	75	1 242	0.6	13	217	0.1	88	1 459	0.3
Subtotal	348	205 100	98.0	89	291 769	100.0	436	496 869	99.2
Prospectors (2)	36	4 224	2.0	–	–	–	36	4 224	0.8
Total 2002	384	209 324	100.0	89	291 769	100.0	472	501 093	100.0

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
– Nil.
(1) Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures. (2) Number of prospectors is underestimated because it contains groups of prospectors.
Notes: Data for 2000 and 2001 are final; 2002 data are based on company spending intentions as compiled in January 2002 and revised in August 2002. Numbers may not add to totals due to rounding.

Figure 2

Exploration and Deposit Appraisal Expenditures in Canada by Junior and Senior Companies, by Province and Territory, 1999-2002



Sources: Natural Resources Canada and Statistics Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

Notes: Exploration and deposit appraisal activities include only the search for and appraisal of new deposits; they do not include work for extensions of deposits already being mined or committed to production. Exploration and deposit appraisal expenditures include off-mine-site and on-mine-site costs incurred for field work and overhead plus engineering, economic and feasibility studies, environment and land access costs. Data for 2001 are final; 2002 data are company spending intentions as compiled in January 2002 and revised in August 2002.

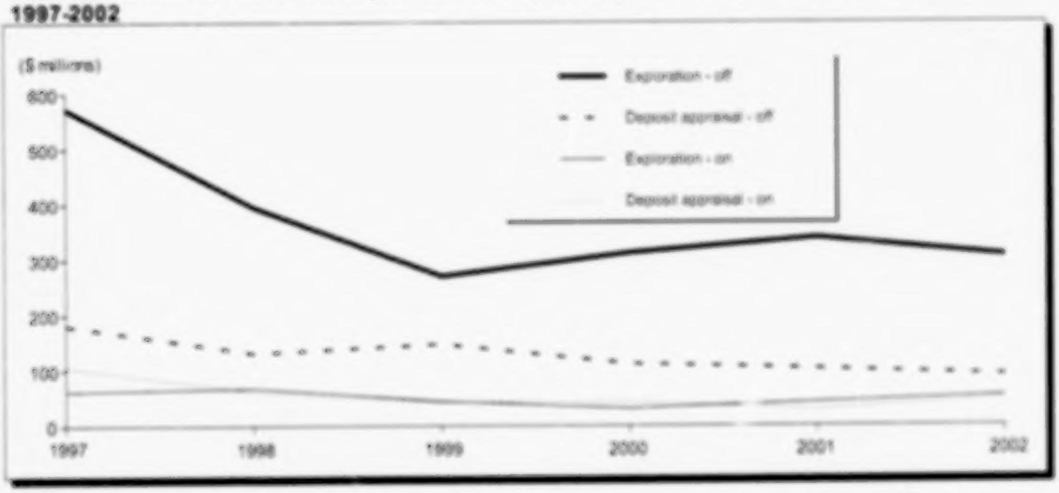
Expenditures for off-mine-site exploration and deposit appraisal activity increased by about 4% (to $441 million) from the 2000 level of $424 million (**Figure 3**). This total was still 41% less than the one recorded in 1997 when $753 million was spent for off-mine-site exploration and deposit appraisal activities in Canada. Overall, 86% of all exploration and deposit appraisal expenditures in 2001 was for off-mine-site activity. Ontario ranked first in off-mine-site spending with 20% of the total for that category, followed closely by the Northwest Territories (19%) and Québec (17%) (**Figure 4**).

TABLE 2. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES IN CANADA, BY PROVINCE AND TERRITORY, 1999-2002

Province/Territory	1999		2000		2001		2002 (r)	
	($000)	(%)	($000)	(%)	($000)	(%)	($000)	(%)
Newfoundland and Labrador	31 304.6	6.2	27 316.7	5.5	29 441.7	5.7	17 790.0	3.6
Nova Scotia	5 258.1	1.0	3 584.6	0.7	2 815.4	0.5	5 892.5	1.2
New Brunswick	10 112.7	2.0	12 128.0	2.4	9 459.2	1.8	3 634.0	0.7
Québec	113 547.0	22.5	94 115.5	19.0	102 946.7	20.1	109 040.0	21.8
Ontario	87 393.3	17.3	117 939.3	23.7	113 639.5	22.2	126 676.9	25.3
Manitoba	22 647.0	4.5	28 120.5	5.7	28 666.7	5.6	30 201.0	6.0
Saskatchewan	43 573.0	8.6	45 580.0	9.2	37 535.1	7.3	41 422.0	8.3
Alberta	14 738.6	2.9	7 237.3	1.5	4 452.9	0.9	8 853.3	1.8
British Columbia	41 310.2	8.2	35 923.6	7.2	29 137.1	5.7	44 902.8	9.0
Yukon	12 743.6	2.5	11 330.1	2.3	7 807.5	1.5	7 253.5	1.4
Northwest Territories	84 122.5	16.7	51 369.3	10.3	86 645.3	16.9	37 669.0	7.5
Nunavut	37 386.7	7.4	62 086.7	12.5	61 318.1	12.0	67 757.0	13.5
Total	504 347.7	100.0	496 651.1	100.0	512 869.2	100.0	501 092.9	100.0
Exploration	314 659.5	62.4	342 524.8	69.0	381 172.5	74.3	360 076.3	71.9
Deposit appraisal	189 688.2	37.6	154 126.2	31.0	131 696.6	25.7	141 016.5	28.1

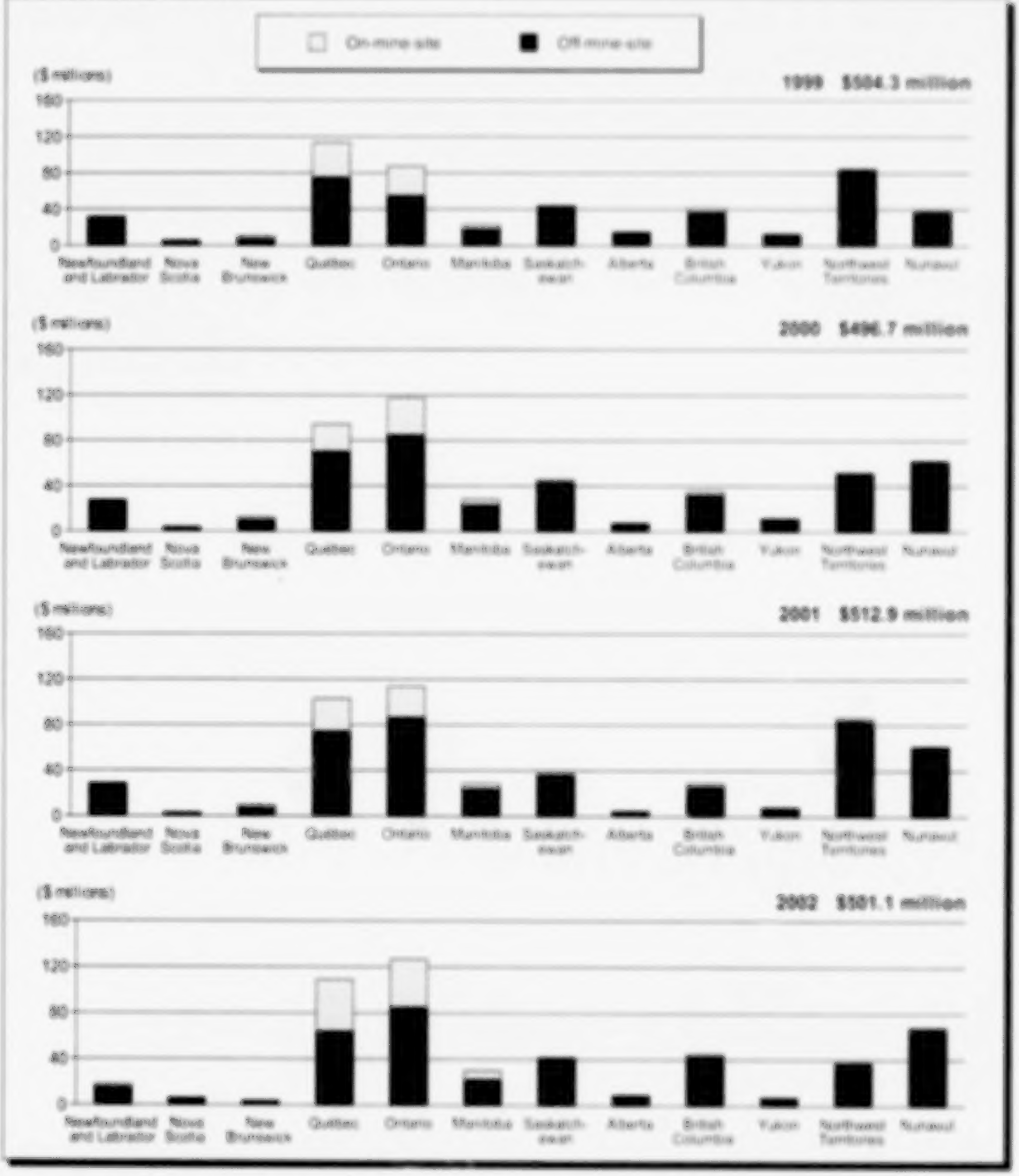
Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
(r) Revised forecast.
Notes: Data for 2000 and 2001 are final; 2002 data are spending intentions as compiled in January 2002 and revised in August 2002. Exploration and deposit appraisal expenditures include off-mine-site and on-mine-site costs incurred for field work and overhead plus engineering, economic and feasibility studies, environment and land access costs. Numbers may not add to totals due to rounding.

Figure 3
On-Mine-Site and Off-Mine-Site Exploration and Deposit Appraisal Expenditures[1] in Canada, 1997-2002



Source: Natural Resources Canada, from the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
[1] On-mine-site and off-mine-site exploration and deposit appraisal expenditures include field work and overhead costs plus engineering, economic and feasibility studies, environment and land access costs.
Note: Data for 2001 are final; 2002 data are company spending intentions as compiled in January 2002 and revised in August 2002.

Figure 4
On-Mine-Site and Off-Mine-Site Exploration and Deposit Appraisal Expenditures, by Province and Territory, 1999-2002



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
Notes: Exploration and deposit appraisal activities include only the search for and appraisal of new deposits; they do not include work for extensions of deposits already being mined or committed to production. Exploration and deposit appraisal expenditures include off-mine-site and on-mine-site costs incurred for field work and overhead plus engineering, economic and feasibility studies, environment and land access costs. Data for 2001 are final; 2002 data are company spending intentions as compiled in January 2002 and revised in August 2002.

On-mine-site exploration and deposit appraisal expenditures decreased slightly (-2%) to $71 million in 2001 from $73 million in 2000. They accounted for 28% of the exploration and deposit appraisal spending recorded in Québec and for 24% in Ontario. A total of $56 million was spent for on-mine-site exploration and deposit appraisal activities in those two provinces alone.

1.3.1.2 Spending by Work Phase

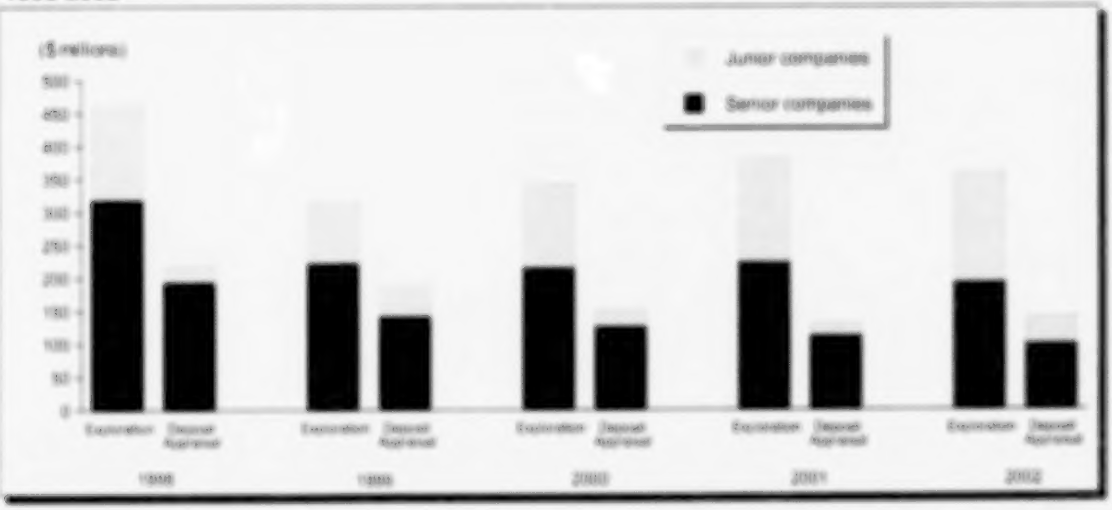
Because of the redesigned survey, it is now possible to follow separately and compare the trends between the exploration phase and the deposit appraisal phase (**Figure 5**).

In 2001, exploration expenditures amounted to $381 million (74% of total exploration and deposit appraisal spending) and deposit appraisal stood at $132 million (26% of total spending). In 2000, spending on the exploration phase had amounted to $343 million while a total of $154 million was spent on deposit appraisal, representing an increase of 11% and a decrease of 15%, respectively.

Off-mine-site spending of $339 million represented 89% of spending in the exploration phase in 2001, slightly less than the 91% recorded in 2000 when $312 million was spent for off-mine-site exploration (**Figure 3**). In terms of deposit appraisal expenditures, approximately 78% of the $132 million recorded for off- and on-mine-site deposit appraisal activities in 2001 was reported as off-mine-site spending.

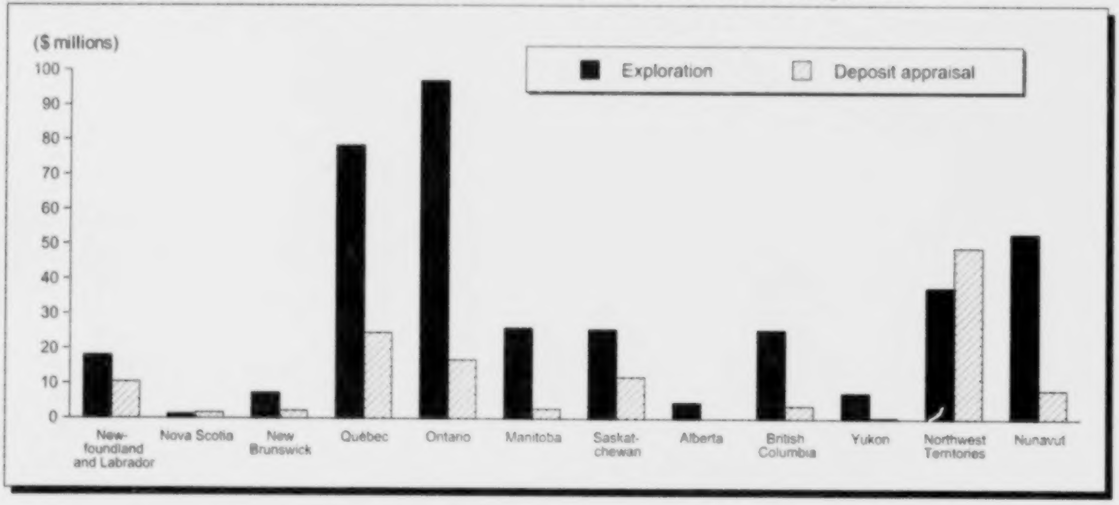
A provincial/territorial breakdown of exploration and deposit appraisal expenditures reveals that all recorded spending in Alberta in 2001 was reported as exploration work (**Figure 6**). The Yukon (95%), Manitoba (90%), British Columbia (87%), Nunavut (87%) and New Brunswick (77%) also recorded high proportions of exploration-related work. While these numbers show a marked preference for grass-roots-type exploration in these provinces/territories, they also highlight a lack of advanced projects. Surprisingly, Ontario also showed a concentration of spending (85%) in the exploration phase in 2001, a situation that may have reflected the reluctance of companies to invest large sums in deposit appraisal projects at a time when metal prices were weak.

Figure 5
Exploration and Deposit Appraisal Expenditures, by Type of Company and by Work Phase, 1998-2002



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
Notes: Exploration and deposit appraisal expenditures include off- and on-mine-site field and overhead expenditures plus engineering, economic and feasibility studies, environment and land access costs. Data for 2001 are final. 2002 data are company spending intentions as compiled in January 2002 and revised in August 2002.

Figure 6
Exploration and Deposit Appraisal Expenditures, by Province and Territory, 2001



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
Notes: Exploration and deposit appraisal expenditures include off- and on-mine-site field and overhead expenditures plus engineering, economic and feasibility studies, environment and land access costs. Data for 2001 are final.

The advanced stage of some diamond projects in the Northwest Territories continues to be reflected by the high proportion of deposit appraisal spending in that territory. In 2001, 57% ($49 million) of all exploration and deposit appraisal expenditures in the Northwest Territories was incurred for deposit appraisal activities.

In terms of ranking by total exploration expenditures, Ontario placed first followed by Québec and Nunavut. For deposit appraisal spending, the Northwest Territories ranked first followed by Québec and Ontario.

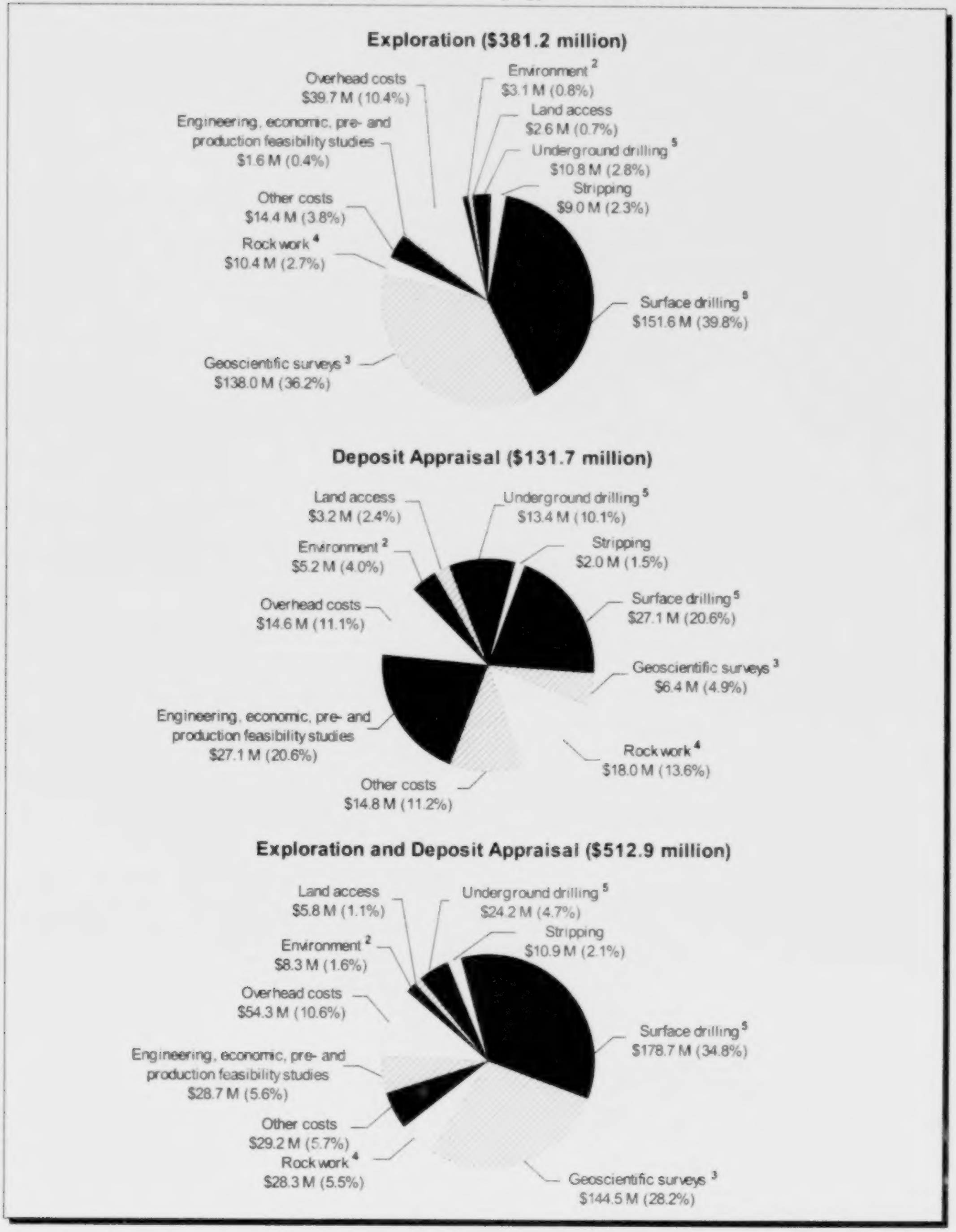
1.3.1.3 Spending by Type of Activity

A detailed cost breakdown for each of the exploration and deposit appraisal phases shows clearly that drilling is the most important cost component in the discovery and delineation of a mineral deposit (**Figure 7**). In 2001, surface and underground drilling (diamond drilling and other types of drilling) accounted for 43% ($162 million) of the $381 million spent on the exploration phase. As can be expected, surface drilling accounted for the vast majority of drilling activity in that work phase. Geoscientific surveys (geology, geochemistry and geophysics) represented the second most important type of expenditures for that work phase with 36% ($138 million) of total exploration spending.

In the deposit appraisal phase, surface and underground drilling accounted for 31% ($41 million) of the total $132 million spent while the preparation of engineering, economic and feasibility studies, and rock work (which includes costs incurred for shaft work, drifts, cross-cuts, raises, declines, rock sampling and dewatering) were second and third with 21% ($27 million) and 14% ($18 million) of total deposit appraisal spending, respectively. The relatively low proportion of drilling expenditures in 2001 deposit appraisal activities can probably be linked to a number of factors, including a drop in deposit appraisal spending in Ontario, a concentration of spending on the exploration phase in Nunavut, and weak metal prices that caused a slowdown in underground drilling.

Figure 7

Exploration and Deposit Appraisal Expenditures,[1] by Type of Work, 2001



Exploration ($381.2 million)

Deposit Appraisal ($131.7 million)

Exploration and Deposit Appraisal ($512.9 million)

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

[1] Includes on-mine-site and off-mine-site activities. [2] Environment includes characterization, permitting, protection, monitoring and restoration.

[3] Geoscientific surveys include geology, geochemistry, ground geophysics and airborne geophysics. [4] Rock work activity includes shaft work, drifts, cross-cuts, raises, declines, rock sampling and dewatering costs. [5] Surface and underground drilling includes diamond and other types of drilling.

Notes: Numbers may not add to totals due to rounding. Data for 2001 are final.

TABLE 3. EXPLORATION, DEPOSIT APPRAISAL AND MINE COMPLEX DEVELOPMENT EXPENDITURES,(1) 2000 AND 2001

Expenditures Category	Exploration 2000	Exploration 2001	Deposit Appraisal 2000	Deposit Appraisal 2001	Exploration Plus Deposit Appraisal 2000	Exploration Plus Deposit Appraisal 2001	Mine Complex Development 2000	Mine Complex Development 2001	Grand Total 2000	Grand Total 2001
					($000)					
Field work and overhead (2)	331 208	373 853	126 880	96 204	458 088	470 057	730 326	742 401	1 188 414	1 212 459
Engineering, economic and pre- or production feasibility studies	6 534	1 573	18 014	27 114	24 548	28 687	57 691	24 389	82 239	53 076
Environment	2 156	3 134	7 567	5 204	9 723	8 338	32 885	57 872	42 608	66 210
Land access	2 627	2 612	1 665	3 175	4 292	5 787	10 089	4 816	14 381	10 603
Subtotal	342 525	381 173	154 126	131 697	496 651	512 869	830 991	829 478	1 327 642	1 342 347
Off-mine-site (3)	311 782	338 876	111 853	102 524	423 635	441 400	n.a.	n.a.	423 635	441 400
On-mine-site (3)	30 743	42 297	42 273	29 173	73 016	71 469	830 991	829 478	904 008	900 948
Capital (4)	4 028	7 582	32 713	1 891	36 741	9 473	1 454 026	1 766 057	1 490 767	1 775 530
$ for environmental protection and restoration (5)	128	–	–	–	128	–	32 207	26 324	32 335	26 324
Total	346 553	388 755	186 840	133 588	533 392	522 342	2 285 017	2 595 535	2 818 410	3 117 877
Repair and maintenance (4)	6 321	1 651	19 310	2 092	25 631	3 742	1 329 021	1 523 963	1 354 652	1 527 705
$ for environmental protection and restoration (5)	2 882	–	1 460	–	4 341	–	32 099	33 239	36 440	33 239
Grand total	352 873	390 405	206 150	135 679	559 023	526 085	3 614 038	4 119 498	4 173 061	4 645 582
Total environment	5 166	3 134	9 027	5 204	14 193	8 338	97 191	117 434	111 384	125 773
Environment as a percentage of grand total	1.5	0.8	4.4	3.8	2.5	1.6	2.7	2.9	2.7	2.7

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

– Nil; n.a. Not applicable.

(1) Includes on-mine-site plus off-mine-site activities; exploration and deposit appraisal activities include only the search for and appraisal of deposits and do not include work for extensions of known reserves. (2) Overhead expenditures include mineral leases, claims and property taxes, and project-related head office expenditures. (3) Amount of exploration and deposit appraisal expenditures dedicated to off-mine-site and on-mine-site activities. (4) Includes construction, and machinery and equipment expenditures. (5) As part of capital expenditures or repair and maintenance expenditures.

Notes: Numbers may not add to totals due to rounding. Data for 2000 and 2001 are final.

Overall, surface and underground drilling accounted for 40% ($203 million) of all exploration and deposit appraisal spending in 2001 while geoscientific surveys ranked second with 28% ($145 million).

As indicated earlier, the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development allows the tracking of exploration and deposit appraisal expenditures that are dedicated to categories of spending other than the traditional field work and overhead ones. As such, it is also possible to follow the spending evolution of other costs such as those related to the environment and land access.

In 1998, a total of $32 million was recorded as environment-related expenditures (which include costs incurred for characterization, permitting, protection, monitoring and restoration), or 5% of all exploration and deposit appraisal expenditures for that year. This percentage declined to 4% in 1999 when $19 million, out of total exploration and deposit appraisal expenditures of $504 million, was spent on environment-related items.

The decline in environment-related exploration and deposit appraisal expenditures continued unabated in 2000 when only $10 million was accounted for by that category of spending (**Table 3**). This amount represented a drop of 48% from the 1999 level and a decline of 79% when compared to the 1997 total of $47 million. Most of the decline recorded in 2000 can be attributed to reduced environmental spending at the deposit appraisal stage. The situation did not improve in 2001 when only $8 million was spent on environment-related activities, a good indication that Canada was lacking advanced-stage projects.

Usually, land access costs (which include costs incurred for Impacts and Benefits, and Socio-Economic agreements, rights of way, damages and permits) only account for a small fraction of total exploration and deposit appraisal expenditures (0.6% in 1998, 1.4% in 1999, 0.9% in 2000 and 1.1% in 2001). However, expenditures for economic, engineering and feasibility studies are more significant. In aggregate, these costs represented 8% ($41 million) of total exploration and deposit appraisal expenditures in 1999 compared to 7% ($45 million) in 1998. For 2000, the costs associated with economic, engineering and feasibility studies amounted to 5% ($25 million) of total exploration and deposit appraisal expenditures. In 2001, these costs represented 6% ($29 million) of total spending.

1.3.1.4 Spending by Type of Company

The analyses within this report often distinguish between senior and junior companies. In general terms, a senior company derives its income from mining or other business ventures and can direct part of that income towards its exploration and deposit appraisal projects. Junior companies, on the other hand, usually have no regular source of income and must finance their projects through the issuance of shares.

In 2001, 110 senior project operators accounted for 65% ($335 million) of all exploration and deposit appraisal expenditures (**Figures 1** and **2**). About two thirds of total senior spending was allocated to exploration activities with the remaining third going to deposit appraisal work (**Figure 5**). The number of senior project operators and their proportion of total spending were slightly higher in 2000 when 117 senior project operators reported 69% ($341 million) of total spending. The lower spending in 2001 by almost the same number of senior project operators is primarily explained by the drop in the number of operators spending more than $1 million. While the number of senior companies spending more than $10 million increased from 8 to 11 in 2001, the number of senior companies spending between $1 million and $10 million dropped by 14 (**Table 1**).

About 65% ($218 million) of the expenditures reported by senior firms in 2001 were incurred in Ontario, Québec and the Northwest Territories (in decreasing order) (**Figure 2**). Senior company expenditures exceeded 70% of total expenditures in each of the Northwest Territories, Saskatchewan, Manitoba, Newfoundland and Labrador, and Québec (in decreasing order). They only amounted to 7% of total exploration and deposit appraisal spending in Nova Scotia and 30% in the Yukon.

The number of junior project operators (including prospectors and prospector groups) increased to 443 in 2001, up by 4% from the 424 recorded in 2000 (**Figure 1** and **Table 1**). Altogether, these junior companies and prospectors spent $178 million on exploration and deposit appraisal in 2001, a relatively strong increase in junior spending of 14% over 2000. This 14% increase follows a 10% increase in junior spending recorded between 1999 and 2000, and points to recently introduced exploration incentives having achieved some success. This rising trend contrasts with decreasing senior spending over that same period.

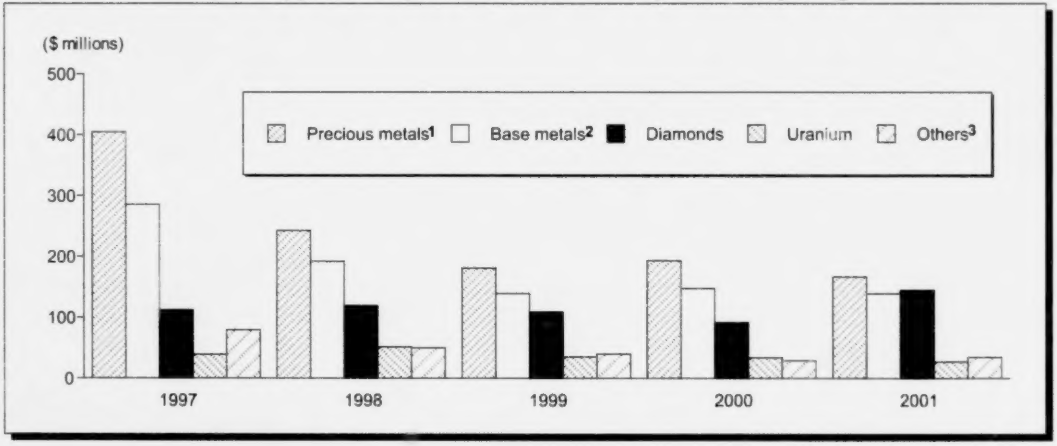
Junior spending continued to increase in Nunavut where that type of spending went from $14 million in 1999 to $33 million in 2000 and stood at $40 million in 2001. Other increases in junior spending in 2001 occurred in Ontario (+$13 million), Québec (+$5 million), the Northwest Territories (+$2 million), New Brunswick (+$1 million) and Manitoba (+$1 million) (**Figure 2**). No province/territory experienced a large drop in junior spending between 2000 and 2001. Together, Nunavut, Ontario and Québec accounted for 62% of all junior exploration and deposit appraisal expenditures in 2001.

In 2001, junior company spending most frequently fell in the $100 000-$500 000 range (**Table 1**). As for senior companies that did explore actively in 2001, the most commonly reported ranges of exploration and deposit appraisal expenditures were $100 000-$200 000 and $1 million-$5 million. For both types of companies, most of the spending was accounted for by project operators spending more than $1 million.

1.3.1.5 Spending by Type of Commodity Sought

The redesigned survey provides a breakdown of exploration and deposit appraisal spending statistics by type of commodity sought. **Figure 8** shows such a breakdown for the groups of commodities or individual commodities most explored for in Canada: precious metals, base metals, diamonds, uranium and "others."

Figure 8
Exploration and Deposit Appraisal Expenditures in Canada, by Commodity Sought, 1997-2001



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
[1] Includes gold, silver and platinum group metals. [2] Includes copper, nickel, lead and zinc. [3] Includes ferrous metals, other metals, nonmetals (including coal), and "not specified."
Notes: Exploration and deposit appraisal expenditures include off- and on-mine-site field and overhead expenditures plus engineering, economic and feasibility studies, environment and land access costs. Data for 2001 are final.

Exploration and deposit appraisal spending for the two main commodity groups, precious metals (mostly gold) and base metals, declined significantly between 1997 and 2000. Precious-metal spending dropped from $405 million in 1997 to $194 million in 2000 while base-metal spending decreased from $286 million to $148 million over the same period. In 2001, precious-metal expenditures declined by a further 14% to $167 million and base-metal spending dropped by 6% to $139 million. Low metal prices are mainly responsible for this downturn in precious- and base-metal exploration and deposit appraisal activity.

Diamonds continue to shine as one of Canada's most sought-after mineral commodities. An additional $92 million was spent on the search for diamonds (exploration and deposit appraisal only) in 2000 and an impressive $145 million in 2001 (**Figure 9**). Considerable sums (over $1 billion since 1994) have been invested in diamond exploration and deposit appraisal activities in Canada with the extremely positive result that this country is becoming one of the dominant players in this industry.

During 2001, the Northwest Territories was once again the recipient of most of the funds spent on the search for diamonds as $79 million was spent in that territory, an impressive increase of 89% from the $42 million spent in 2000. This increase in exploration and deposit appraisal spending indicates that, even after investment shifted to mine development and production at the Ekati and Diavik mines, there remains a sustained effort to find and develop new diamond mines in the Northwest Territories. Ontario ($28 million), Nunavut ($18 million) and Québec ($8 million) were the other most popular Canadian jurisdictions for diamond exploration and deposit appraisal in 2001.

Table 4 combines information on the types of companies conducting exploration and deposit appraisal activities and the types of commodities sought by these companies. In 2000, senior companies, as a whole, spent $121 million on the search for precious metals and $104 million on the search for base metals, with these two commodity groups accounting for almost two thirds of their total spending. Diamonds ($69 million) and uranium ($30 million) also represented major exploration and deposit appraisal targets for senior companies.

In 2001, diamonds finally outranked precious and base metals as the favourite exploration and deposit appraisal target of senior companies. A total of $106 million was spent by senior companies on the search for diamonds in that year compared to $95 million for base metals and $90 million for precious metals.

TABLE 4. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, (1) BY TYPE OF COMPANY AND MINERAL COMMODITY, 2000 AND 2001

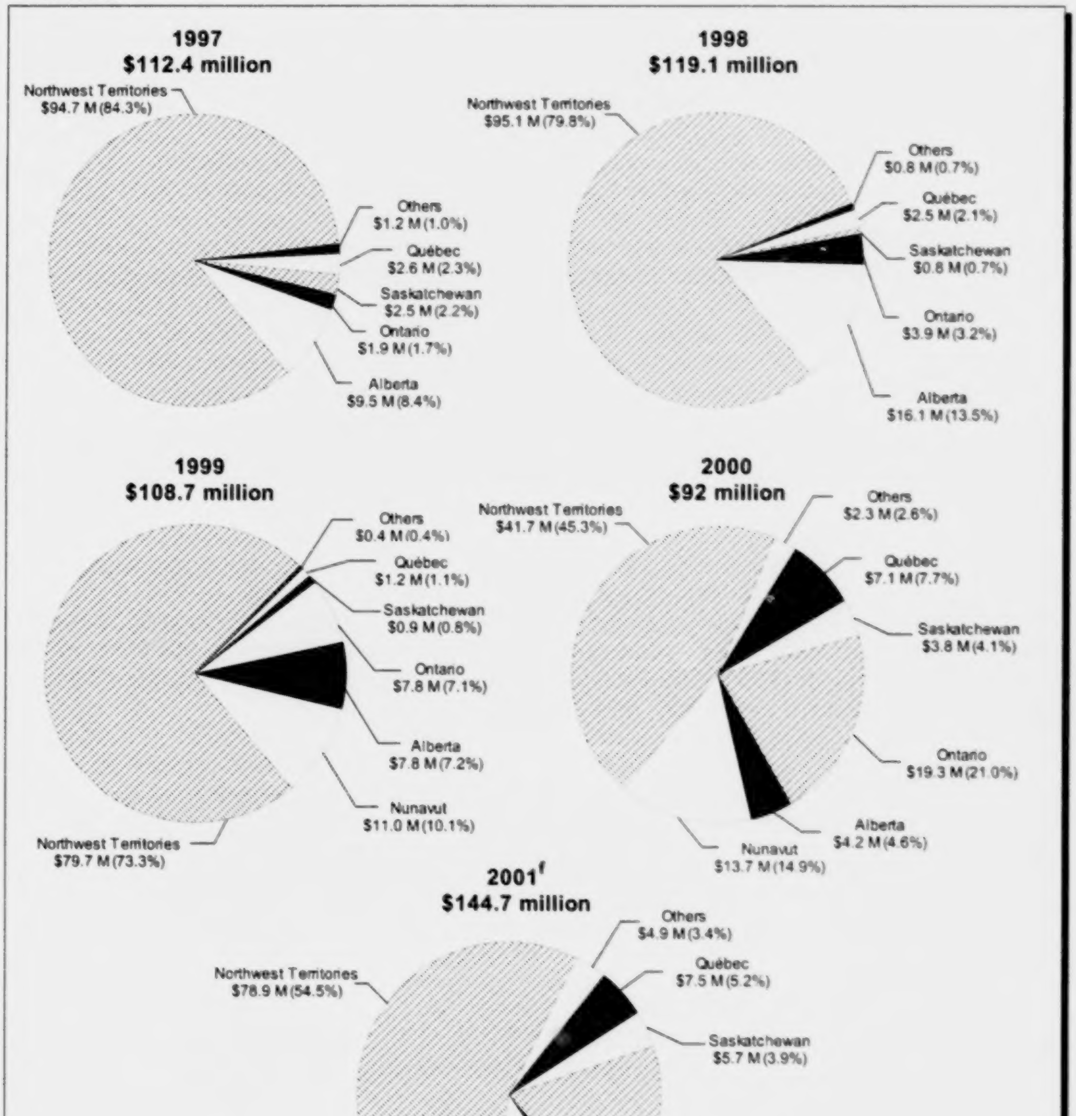
Type of Company	Base Metals	Precious Metals	Uranium	Diamonds	Others	Total
			($000)			
2000						
Junior companies and prospectors	44 146	72 213	3 714	22 613	13 276	155 962
Senior companies	103 809	121 316	30 214	69 333	16 018	340 689
Total	147 955	193 529	33 928	91 946	29 294	496 651
2001						
Junior companies and prospectors	44 293	76 440	1 973	39 141	15 885	177 733
Senior companies	95 150	90 482	25 116	105 555	18 833	335 136
Total	139 443	166 922	27 089	144 697	34 719	512 869

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

(1) Exploration and deposit appraisal expenditures include off-mine-site and on-mine-site costs incurred for field work and overhead plus engineering, economic and feasibility studies, environment and land access costs.

Notes: Data for 2000 and 2001 are final. Numbers may not add to totals due to rounding.

Figure 9
Diamond Exploration and Deposit Appraisal Expenditures in Canada, by Province and Territory, 1997-2001



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
f Final.

Notes: Exploration and deposit appraisal expenditures include off- and on-mine-site field and overhead expenditures plus engineering, economic and feasibility studies, environment and land access costs. Numbers may not add to totals due to rounding.

As for junior companies and prospectors, they showed a marked preference for precious-metals exploration in both 2000 and 2001 with 46% ($72 million) and 43% ($76 million) of their respective total 2000 and 2001 exploration and deposit appraisal expenditures dedicated to the search for gold and platinum group metals (PGMs). Base-metals exploration was a distant second in both years. Junior companies significantly increased their spending on the search for diamonds in 2001 when they spent $39 million, compared to $23 million in the previous year.

1.3.2 2002 Exploration and Deposit Appraisal Expenditures

1.3.2.1 Statistical Summary

As explained in the opening paragraphs of this chapter, company spending intentions for 2002 were compiled in January 2002 and revised in August of the same year. While this new approach will yield more accurate forecasts of exploration and deposit appraisal expenditures, it has also resulted in a less detailed forecast survey exercise. Therefore, data that had appeared in previous editions of this report and in Section 1.3.1 of this document on spending by type of commodity and by type of work are not available in the 2002 revised forecast results. They will only be available when the final survey results for 2002 are released in the first quarter of 2003.

Company spending intentions, compiled in January 2002 and revised in August 2002, reveal that 472 project operators (companies and prospectors) and some prospectors intended to spend some $501 million in 2002 on exploration and deposit appraisal in Canada (**Figures 1** and **2**). That number of project operators represents a 15% decrease from the 2001 total of 553 (expenditures of $513 million). A total of 87 companies (78 in 2001) each intended to spend more than $1 million (**Table 1**). These 87 companies expected to spend a total of $418 million, or 83% of total intended expenditures for 2002.

The difference between the 553 project operators that reported their intention to spend in 2001 and the 472 companies that did so in 2002 is explained mostly by the drop of 112 companies (most of them juniors and prospectors) in the last three spending intervals (59 companies in the $0-$50 000 range, 18 in the $50 000-$100 000 range and 35 in the $100 000-$200 000 range). As opposed to previous years, when a declining number of companies in these three spending intervals simply meant that companies had become inactive or left the industry, the 2002 decline is more likely the result of companies spending more in that year than they did in 2001. For example, 89 junior companies reported spending plans in the $200 000-$500 000 range for 2002. In 2001, the corresponding number was 72. In the $500 000-$1 million range, six more junior companies reported spending plans than in the previous year and, in the $1 million-$5 million interval, an additional 10 junior companies were counted. In these top three spending intervals, junior companies were planning to spend $30 million (+29%) more than in 2001. These numbers reflect a junior company sector that has seen its membership go down but its overall importance go up in the past year as junior companies are involved in more significant projects and appear to have better access to financing.

Based solely on spending levels, the fact that the 2002 revised forecast of $501 million is still lower than the $513 million recorded in 2001 seems to indicate a return to the downward trend in exploration and deposit appraisal expenditures that had started in 1997. However, a strong fourth quarter in terms of companies announcing flow-through share financings and a rising gold price could help improve the picture when the final 2002 statistics are released. At the time of writing this report, geopolitical uncertainty was putting upward pressure on the price of gold and anecdotal evidence, in the form of company press releases on financings and exploration projects, were pointing to a better year in 2003.

Approximately 60% of the total intended exploration and deposit appraisal expenditures for 2002 were reported, in decreasing order, by Ontario, Québec and Nunavut (**Figure 2** and **Table 2**). Increases in expenditures totaling $54 million are expected in eight provinces/territories. British

Columbia (+$16 million) and Ontario (+$13 million) are expected to experience the largest increases compared to 2001. As for those provinces/territories that will experience spending decreases (totaling $66 million for a net loss of $12 million) in 2002, it is the Northwest Territories that is expected to suffer the most with a loss of $49 million from its previous year's total of $87 million. Much of this forecast decline can be attributed to a delay at a major diamond project. New Brunswick (-62%) and Newfoundland and Labrador (-38%) are also expected to experience important declines in their exploration and deposit appraisal spending levels.

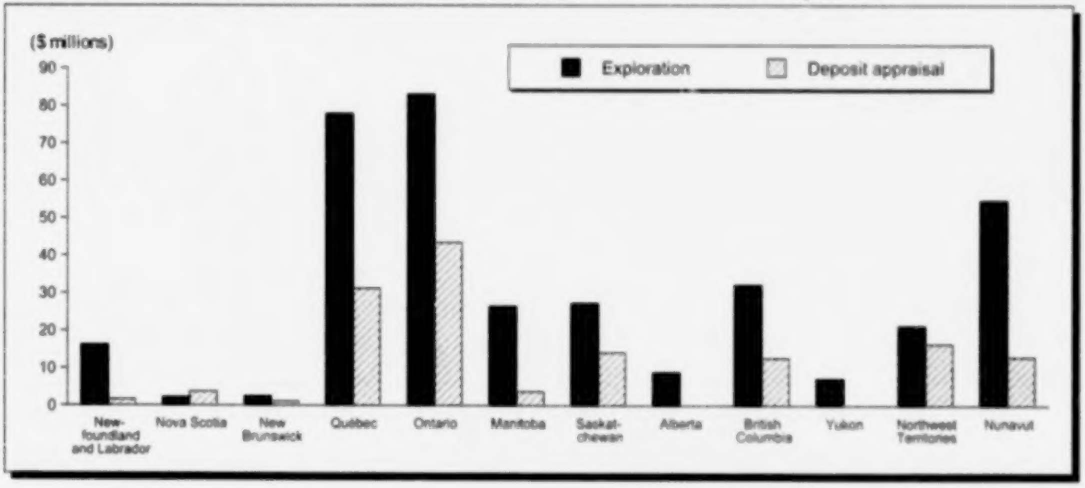
Company spending intentions indicate that off-mine-site exploration and deposit appraisal expenditures are expected to decline by about 10% in 2002 with spending of $398 million compared to $441 million in 2001 (**Figure 3**). The Northwest Territories ($47 million), Newfoundland and Labrador ($13 million) and Québec ($10 million) will experience the most significant decreases for that type of spending (**Figure 4**). An increase of approximately $17 million is expected in British Columbia. Overall, off-mine-site spending should account for 79% of total exploration and deposit appraisal expenditures in 2002. Ontario is expected to rank first in off-mine-site exploration and deposit appraisal activity with 21% ($85 million) of the total spending intentions for that category, followed by Nunavut (17%) and Québec (16%).

On-mine-site exploration and deposit appraisal spending is expected to increase by 44% to $103 million in 2002. These expenditures had been dropping since 1998 as a result of mining companies curtailing their exploration and deposit appraisal budgets in times of weak metal prices. This upward forecast should help alleviate concerns about diminishing prospects for outlining and discovering additional reserves at existing mines. Québec ($45 million) and Ontario ($42 million) will account for 84% of all Canadian on-mine-site exploration and deposit appraisal expenditures in 2002.

1.3.2.2 Spending by Work Phase

For 2002, company spending intentions indicate that expenditures dedicated to exploration activities will drop by 6% to $360 million (**Figure 10**). This amount represents 72% of total intended exploration and deposit appraisal expenditures for that year. Of this $360 million total, $307 million (85%) will be incurred off mine sites (**Figure 3**).

Figure 10
Exploration and Deposit Appraisal Expenditures, by Province and Territory, 2002



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
Notes: Exploration and deposit appraisal expenditures include off- and on-mine-site field and overhead expenditures plus engineering, economic and feasibility studies, environment and land access costs. Data for 2002 are based on a survey of company intentions compiled in January 2002 and revised in August 2002.

Deposit appraisal spending is expected to amount to $141 million in 2002. At 65% of total deposit appraisal spending, the proportion of off-mine-site deposit appraisal spending confirms that a higher percentage of appraisal work takes place on mine sites than is the case for the exploration phase.

On a provincial/territorial basis, exploration expenditures are expected to once again represent 100% of the combined 2002 exploration and deposit appraisal expenditures in Alberta (**Figure 10**). The Yukon is also expected to have almost all of its work recorded under the exploration category. The proportion of exploration work, out of total exploration and deposit appraisal spending, in other provinces/territories is also expected to exceed 80% in Newfoundland and Labrador, Manitoba and Nunavut.

In terms of ranking by total exploration expenditures, Ontario is expected to rank first followed by Québec and Nunavut. Together these three provinces/territory should contribute about 60% of total Canadian exploration phase expenditures in 2002.

Ontario will take over from the Northwest Territories in terms of deposit appraisal spending in 2002 with forecast expenditures of $44 million, a 159% increase over the 2001 total of $17 million. Québec ($31 million) will rank second.

1.3.2.3 Spending by Type of Company

Based on company spending intentions compiled in January 2002 and revised in August 2002, a total of 88 senior project operators expected to spend $292 million in 2002, accounting for 58% of all exploration and deposit appraisal expenditures for that year (**Figures 1** and **2**). About 66% of total spending by seniors was expected to be allocated to exploration activities and the balance to deposit appraisal activities (**Figure 5**).

In 2001, 110 senior project operators had reported 65% ($335 million) of total exploration and deposit appraisal expenditures in Canada. The 20% decline in the number of active senior companies in 2002 was accompanied by a 13% decline in expenditures for that category of companies. The decline in terms of total expenditures by senior companies is more noticeable in the above $10 million range of company spending where approximately $64 million less is expected to be spent in 2002 (**Table 1**). Some of that decline will be mitigated by an increase of $24 million in the budgets of companies planning to spend between $1 million and $10 million.

More than half (54%) of the expenditures reported by senior firms in 2002 will be incurred in Ontario and Québec (in decreasing order). Senior firms are expected to decrease their expenditures in 2002 in six provinces/territories. The most severe decrease is forecast to occur in the Northwest Territories where senior spending is predicted to fall from $72 million in 2001 to $28 million in 2002. As mentioned earlier, this decline will result mostly from the delay of a major project. Ontario is expected to experience the largest increase (+$11 million).

The number of junior project operators (including prospectors and prospector groups) is expected to drop again in 2002 to 384, a 13% decrease from the 443 recorded in 2001 (**Figure 1**). However, junior spending is expected to increase by 18% to $209 million, its highest level since 1997 when junior spending reached $298 million (**Figure 2**). Junior spending will thus have risen for a fourth consecutive year.

The paradox of having fewer junior firms spending more in aggregate can be explained primarily by the increased number of juniors planning to spend in excess of $1 million in 2002 (**Table 1**). Altogether, a total of 49 junior companies are expected to spend more than that sum, compared to 39 in 2001. The number of companies planning to spend between $200 000 and $1 million has also increased from 114 to 137, providing more evidence of a junior mining sector that is reclaiming its place as an essential component of the Canadian mining industry.

Increases in expenditures by juniors are expected in eight provinces/territories for a combined increase of $38 million. British Columbia is expected to record the largest increase ($16 million). All decreases in junior spending are expected to be relatively small with the largest one occurring in the Northwest Territories (-$5 million). In decreasing order of expenditures, Nunavut, Ontario, Québec and British Columbia as a group are expected to account for 76% of all junior expenditures in 2002.

1.3.2.4 Statistical Estimation of Exploration and Deposit Appraisal Spending (Based on Field and Overhead Costs Only)

1.3.2.4.1 METHODOLOGY

In this section, an attempt is made to predict the level of exploration and deposit appraisal spending for 2002 using standard statistical estimation techniques. Expenditures are estimated by linking historical exploration and deposit appraisal spending (field and overhead expenditures only) to factors for which historical data are available.

An analysis of historical data indicates that the level of expenditures on mineral exploration and deposit appraisal in a given year can be linked to the previous year's metal prices. This may be because companies view exploration and deposit appraisal as an investment, with expected returns on that investment dependent on expected revenues from the subsequent mining of discovered deposits. Expected future revenues would obviously depend on future mineral and metal prices, and expectations of future prices would likely be influenced by current prices. As well, metal prices influence the level of a mining company's revenues and profits, and are an important determinant of the amount of internal funds available for spending on exploration and deposit appraisal.

Changes in spending are likely to lag changes in metal prices because exploration and deposit appraisal activity in a particular year is the result of a budgeting process that takes place in the preceding year. Budget allocations in a given year are therefore likely to reflect the metal prices and company profits of the preceding year.

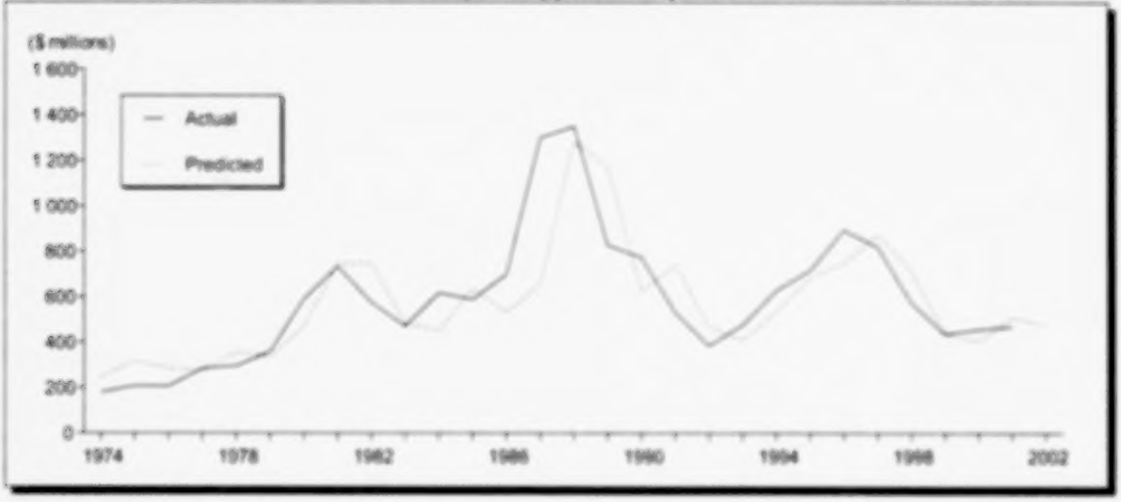
To capture this relationship between exploration, deposit appraisal and metal prices, the NRCan yearly Metals Price Index, lagged one year, was included in the estimating equation. This index is a Fisher Ideal Index based on the prices of six metals: gold, silver, copper, zinc, lead and nickel.

Mineral exploration and deposit appraisal is a multi-stage process (see Appendix 2) that usually proceeds over a relatively long period of time as information is gathered from geological mapping, geophysical and geochemical surveying, diamond drilling, and so on. At various stages, this information is used by companies to decide on where to concentrate further activity and, indeed, whether to proceed at all. If early stages of exploration are successful in discovering promising mineralization, the company has a strong incentive to proceed with more detailed, and more costly, drilling and analysis, and to launch a feasibility study, thereby increasing the amount it spends on exploration and deposit appraisal. It can therefore be argued that exploration and deposit appraisal in a given period is related to spending in previous periods. To capture this relationship, a lagged dependent variable was also included in the equation.

1.3.2.4.2 RESULTS

It is important to remember that the following results are based on an analysis of expenditures that include only field and overhead costs. The new categories of expenditures, such as environment, land access, economic, engineering and feasibility studies, were excluded for the years for which they are available (1997 onwards) in order to establish a valid comparison. It is also important to remember that diamonds are not included in NRCan's Metals Price Index and that they have accounted for much exploration and deposit appraisal spending in recent years.

Figure 11
Actual and Predicted Exploration and Deposit Appraisal Expenditures in Canada, 1974-2002



Source: Natural Resources Canada.
Note: For comparison with pre-1997 years, the data include only off- and on-mine-site field and overhead expenditures.

Therefore, notwithstanding these caveats and using data for the years 1974-2001, the statistical equation predicts total expenditures of $477 million for 2002 (**Figure 11**). This estimation is slightly above the $470 million level that was actually recorded in 2001 for field and overhead costs (see **Table 24** in Appendix 1) and would mean a third consecutive increase in core spending (field and overhead costs only) since the trough of 1999.

1.4 DRILLING

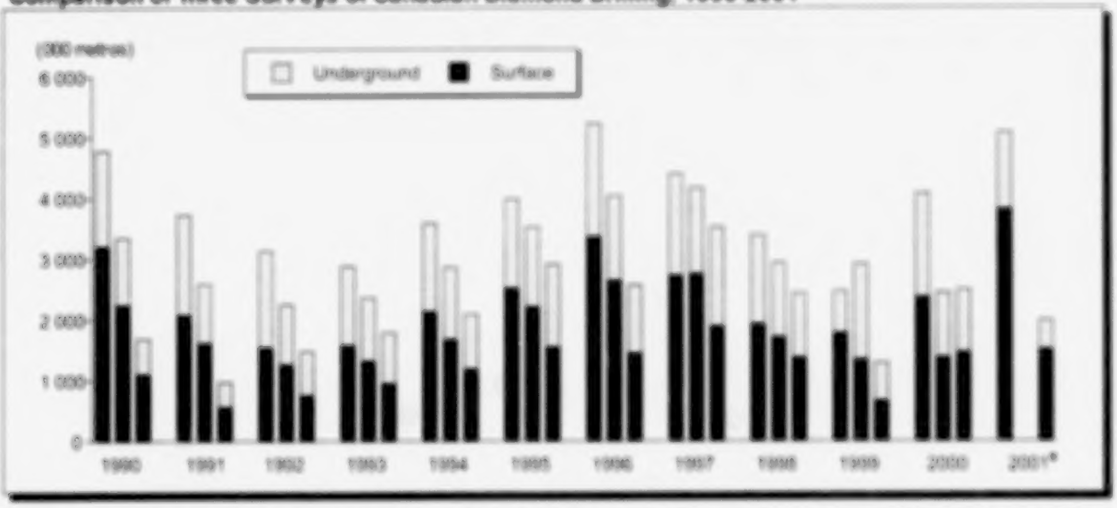
Drilling activities are an essential component of the mineral development cycle from the anomaly investigation stage to the deposit delineation and deposit definition stages. As such, drilling statistics constitute a valuable indicator of recent levels of Canadian mineral exploration and deposit appraisal activity.

1.4.1 Statistical Sources

Diamond drilling is the most widely used drilling method for determining the existence, location, extent, grade and tonnage of a mineral deposit. Canada harbours an important diamond drilling industry and many of its companies are represented by the Canadian Diamond Drilling Association (CDDA). The CDDA gathers diamond drilling statistics from its members, which cover about 50-60% of total Canadian contract diamond drilling activity. Although incomplete, these data provide a reasonable and the most up-to-date indication of recent national mineral exploration and deposit appraisal trends.

The yearly drilling statistics compiled by the CDDA are depicted in **Figure 12** along with two other sets of diamond drilling statistics. These are: total Canadian contract diamond drilling, as reported annually to Natural Resources Canada by drilling contractors and published in Statistics Canada's catalogue no. 26-201; and diamond drilling data from the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures, which include all metres (m) drilled and expenditures reported by companies for their "own account" (drilling they did themselves) and for contracted drilling work.

Figure 12
Comparison of Three Surveys of Canadian Diamond Drilling, 1990-2001



Sources: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures (left bar in each cluster); contract diamond drilling survey (middle bar in each cluster); Canadian Diamond Drilling Association (CDDA) (right bar in each cluster).
* Contract diamond data for 2001 were not yet available at press time.
Note: All data include exploration, deposit appraisal and mine development drilling.

In this last set of data, exploration drilling and deposit appraisal drilling have been aggregated with mine development drilling to allow a valid comparison with the other two sets of statistics. Mine-site development drilling (mainly underground) consists of drilling aimed at extending ore reserves at producing mines. This type of drilling will not be considered in the rest of the drilling analysis, but the reader should be aware that the number of metres drilled for mine development in a given year often exceeds that of total exploration and deposit appraisal drilling.

1.4.1.1 Comparison of Drilling Statistics

Although the three sources of statistics mentioned above provide different annual results, the same overall trends are observable in the three surveys over most of the period 1990-2001.

On an annual basis, the CDDA diamond drilling statistics confirm the trends observed in exploration and deposit appraisal expenditures in recent years. **Figure 12** shows that, after peaking in 1997, the drilling reported to the CDDA declined by 31% in 1998 and by a further 47% between 1998 and 1999. CDDA statistics for 2000 show a complete reversal of the downward trend with a 94% increase over the 1999 level. However, that reversal was short-lived as the number of metres drilled declined by 20% in 2001. As explained earlier in this chapter, this decline can be attributed to a drop in deposit appraisal spending, but also to a sharp decline in underground diamond drilling as mine development activities were curtailed as a result of weak metal prices. On the other hand, the CDDA statistics do show strong surface diamond drilling numbers for 2001 and that, again, is a reflection of an improving picture for the exploration work phase and the junior mining sector. The CDDA statistics for 2002 were expected to be available shortly after the publication of this report (March 2003).

1.4.2 Drilling by Work Phase

According to the federal-provincial/territorial survey, a total of 1 766 000 m of surface and underground drilling (including diamond drilling and other drilling methods) was carried out for exploration and deposit appraisal purposes in Canada in 2001, compared to 2 080 000 m in 2000 (**Tables 5** and **6**). Of this, 1 679 000 m were accounted for by diamond drilling, down by 18% from the 2 049 000 m drilled in 2000.

Some 82% (1 442 000 m) of the total drilling activity in 2001 was dedicated to the exploration phase while the remaining 18% (325 000 m) was dedicated to deposit appraisal work. In terms of provincial/territorial rankings, Ontario and Québec dominated exploration-phase drilling with a combined 54% of the total metres drilled for that year. These two provinces also accounted for almost two thirds of all deposit appraisal drilling.

1.4.3 Drilling by Type of Company

Senior companies accounted for 63% (1 109 000 m) of all surface and underground drilling (including diamond drilling and other drilling methods) in the exploration and deposit appraisal phases in 2001 (**Table 7**).

In terms of surface and underground drilling, senior companies accounted for virtually all of the underground drilling in each of the two work phases. Surface drilling activity was more evenly divided as seniors accounted for 53% (740 000 m) of the total compared to 47% (653 000 m) for junior companies. For junior companies, the 653 000-m total represented a 21% increase from the 2000 level of 541 000 m. Senior companies, on the other hand, saw their surface drilling activity go down by 12% between 2000 and 2001.

Exploration drilling by senior companies was mostly conducted from the surface while their deposit appraisal drilling mostly took place underground. As can be expected, the drilling activities of junior companies were almost exclusively focused on surface exploration and deposit appraisal.

TABLE 5. SURFACE AND UNDERGROUND EXPLORATION AND DEPOSIT APPRAISAL DRILLING,(1) BY PROVINCE AND TERRITORY, 2000 AND 2001

Province/Territory	Surface Drilling			Underground Drilling			Total Drilling		
	Exploration	Deposit Appraisal	Total	Exploration	Deposit Appraisal	Total	Exploration	Deposit Appraisal	Total
					(000 m)				
2000									
Newfoundland and Labrador	[illegible]	[illegible]	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]
Nova Scotia	[illegible]	[illegible]	[illegible]	–	–	–	[illegible]	[illegible]	[illegible]
New Brunswick	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Quebec	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ontario	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Manitoba	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saskatchewan	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Alberta	[illegible]	–	[illegible]	–	–	–	[illegible]	[illegible]	[illegible]
British Columbia	[illegible]	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Yukon	[illegible]	[illegible]	[illegible]	–	–	–	[illegible]	[illegible]	[illegible]
Northwest Territories	[illegible]	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nunavut	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2001									
Newfoundland and Labrador	[illegible]	[illegible]	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]
Nova Scotia	[illegible]	[illegible]	[illegible]	–	–	–	[illegible]	[illegible]	[illegible]
New Brunswick	[illegible]	–	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Quebec	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ontario	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Manitoba	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saskatchewan	[illegible]	–	[illegible]	[illegible]	–	[illegible]	[illegible]	–	[illegible]
Alberta	[illegible]	–	[illegible]	[illegible]	–	[illegible]	[illegible]	–	[illegible]
British Columbia	[illegible]	[illegible]	[illegible]	–	–	–	[illegible]	[illegible]	[illegible]
Yukon	[illegible]	–	[illegible]	–	–	–	[illegible]	–	[illegible]
Northwest Territories	[illegible]	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nunavut	[illegible]	[illegible]	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
– Nil.
(1) Includes diamond drilling and other drilling methods such as rotary and percussion.
Note: Numbers may not add to totals due to rounding.

TABLE 6. SURFACE AND UNDERGROUND EXPLORATION AND DEPOSIT APPRAISAL DRILLING IN CANADA, 1985-2001

	Diamond Drilling			Other Drilling (1)		
	Metres Drilled			Metres Drilled		
Year	Exploration	Deposit Appraisal	Total	Exploration	Deposit Appraisal	Total
			(000 m)			
1985	. .	. .	2 531	. .	. .	270
1986	. .	. .	3 616	. .	. .	56
1987	. .	. .	6 221	. .	. .	262
1988	. .	. .	6 206	. .	. .	211
1989	. .	. .	3 940	. .	. .	297
1990	. .	. .	3 702	. .	. .	241
1991	. .	. .	2 341	. .	. .	234
1992	. .	. .	1 889	. .	. .	139
1993	. .	. .	1 932	. .	. .	282
1994	. .	. .	2 626	. .	. .	213
1995	. .	. .	2 993	. .	. .	280
1996	. .	. .	3 898	. .	. .	169
1997 (a)	2 670	734	3 404	157	239	396
1998	2 024	433	2 458	58	82	140
1999	1 693	583	2 277	62	127	189
2000	1 490	559	2 049	22	9	31
2001	1 358	321	1 679	83	4	87

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

. . Not available.

(a) The exploration and deposit appraisal phases were adopted as part of the survey redesign in 1997.

(1) Other drilling methods include rotary and percussion.

TABLE 7. SURFACE AND UNDERGROUND EXPLORATION AND DEPOSIT APPRAISAL DRILLING (1) IN CANADA, BY TYPE OF COMPANY, 2000 AND 2001

Type of Company	Exploration Drilling	Deposit Appraisal Drilling	Total by Type of Company
		(000 m)	
2000			
Junior companies			
Surface	491.9	48.6	540.5
Underground	1.6	17.9	19.5
Subtotal	493.5	66.5	560.0
Senior companies			
Surface	758.4	84.8	843.2
Underground	259.8	416.5	676.3
Subtotal	1 018.2	501.3	1 519.5
Total	1 511.7	567.8	2 079.5
2001			
Junior companies			
Surface	599.3	54.1	653.4
Underground	3.9	–	3.9
Subtotal	603.2	54.1	657.3
Senior companies			
Surface	663.6	76.7	740.3
Underground	174.4	194.2	368.6
Subtotal	838.0	270.9	1 108.9
Total	1 441.2	325.0	1 766.2

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

– Nil.

(1) Includes diamond drilling and other drilling methods such as rotary and percussion.

1.4.4 Drilling by Type of Commodity Sought

In terms of total surface and underground drilling (including diamond drilling and other drilling methods) by group of commodity sought, **Figure 13** shows that exploration and deposit appraisal drilling activities in Canada in 2000 and 2001 were primarily aimed at the discovery of precious metals and base metals. In 2001, a total of 873 000 m was drilled in the search for precious metals, representing 49% of total exploration and deposit appraisal drilling. Of this total, 626 000 m (72%) were drilled from the surface. Drilling for base metals accounted for 34% (592 000 m) of total exploration and deposit appraisal drilling and, once again, surface drilling was more prevalent with 84% (495 000 m) of the drilling aimed at this commodity group.

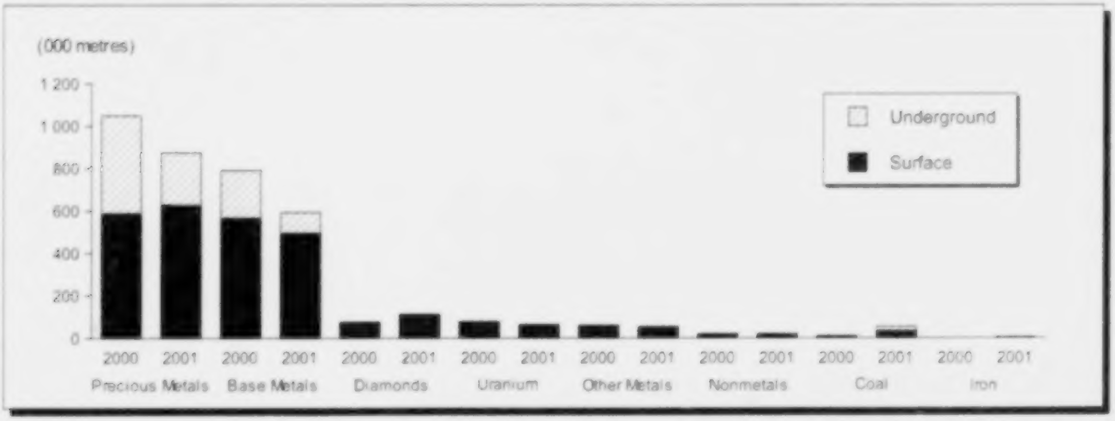
Surface drilling also accounted for most of the exploration and deposit appraisal drilling activity aimed at discovering commodities other than precious and base metals in 2001. In fact, it represented all, or almost all, of the drilling conducted within these two phases of activity for the discovery of diamonds, uranium, nonmetals and iron.

1.5 CLAIM STAKING

Claim staking is another useful indicator of exploration activity. It is particularly efficient at rapidly highlighting emerging trends, such as the mid- and late-1990s exploration rush for diamonds, and at pinpointing areas of interest. Because claim staking usually happens at a relatively early stage of the exploration and deposit appraisal process, it also provides a good measure of current grass-roots-type activities and a good insight into where future advanced (deposit appraisal) work could be focused.

Since claim staking rules and guidelines differ across Canada, the reader is invited to contact the respective provincial/territorial mine recorders for more information on staking activity in a particular jurisdiction (i.e., ground or map staking; cost and size of claims, permits and leases; assessment work requirements, etc.).

Figure 13
Surface and Underground Exploration and Deposit Appraisal Drilling[1] in Canada, by Commodity, 2000 and 2001



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
[1] Includes diamond drilling and other drilling methods such as rotary and percussion.
Note: For 2000, "Other metals" group was estimated.

1.5.1 New Claims Staked

The area of new mineral claims staked in Canada in 2001 (**Table 8**) totaled some 11.2 million hectares (Mha), slightly more than the 10.3 Mha recorded in 2000. The largest area of new mineral claims recorded in a single year in Canada was 44.2 Mha in 1997, followed by 33 Mha in 1992 and 27 Mha in 1993. The totals recorded for both 2000 and 2001 compare favourably to the levels recorded prior to 1992, that is, prior to the major exploration and deposit appraisal efforts that were triggered by the discovery of diamonds in the Northwest Territories and, later, base metals in Labrador.

Once again, it is the province of Alberta that had the most influence on the yearly variation of the total number of hectares staked in Canada. In 2001, Alberta experienced a 78% (+1.8 Mha) increase in new claims staked, but spending did not follow suit as only $4 million was spent there during that year. While this amount was expected to increase to $9 million in 2002, exploration and deposit appraisal expenditures in Alberta are still well below the levels that could be expected from a province with both the largest area of new mineral claims staked and the largest area occupied by claims in good standing (**Table 9**).

1.5.2 Claims in Good Standing

The total area occupied by claims in good standing amounted to approximately 3.3% of Canada's total landmass in 2001, compared to 3.5% in 2000. This decrease of 1.8 Mha is again mostly attributable to Alberta where the surrendering of permits (claims) staked in previous years resulted in an overall drop of 2.7 Mha in the area of claims in good standing in that province. In Manitoba, which saw its area of new mineral claims staked decrease by 0.7 Mha in 2001 (**Table 8**), the area occupied by claims in good standing nevertheless increased by 1 Mha as some of the claims staked for diamonds in 2000 were maintained.

In 2001, spending per hectare of claims in good standing ranged between $0.46/ha in Alberta and $31.84/ha in New Brunswick (**Figure 14**). This considerable variation is often explained by the type of staking (ground vs. map) and the size of the claims or permits rather than by the actual intensity of exploration (more advanced vs. reconnaissance-type work) in a given province/territory. For Canada as a whole, exploration and deposit appraisal spending (off-mine-site) amounted to an average of $13.34/ha of claims in good standing.

TABLE 8. AREA OF NEW MINERAL CLAIMS[1] STAKED IN CANADA, 2000 AND 2001

Province/Territory	2000		2001	
	(hectares)	(%)	(hectares)	(%)
Newfoundland and Labrador	324 225	3.1	391 625	3.5
Nova Scotia	96 819	0.9	87 722	0.8
New Brunswick	49 344	0.5	35 712	0.3
Québec	2 187 551	21.2	2 115 424	19.0
Ontario	874 896	8.5	981 904	8.8
Manitoba	1 759 381	17.1	1 054 106	9.4
Saskatchewan	523 440	5.1	558 131	5.0
Alberta	2 349 600	22.8	4 192 055	37.6
British Columbia	699 050	6.8	636 800	5.7
Yukon	52 675	0.5	38 713	0.3
Northwest Territories	891 419	8.6	626 177	5.6
Nunavut	498 230	4.8	441 270	4.0
Total	10 306 630	100.0	11 159 639	100.0

Source: Provincial and territorial mining recorders.

(1) Excludes coal.

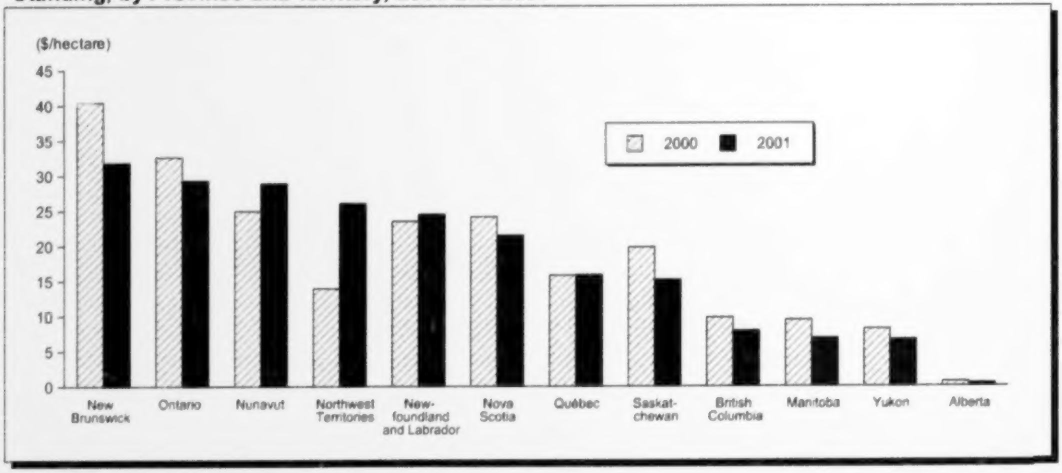
TABLE 9. AREA OCCUPIED BY CLAIMS IN GOOD STANDING IN CANADA, 2000 AND 2001

Province/Territory	Total Area	Area of Claims in Good Standing	Area of Claims/ Total Area
	(hectares)		(%)
2000			
Newfoundland and Labrador	40 572 000	1 115 120	2.7
Nova Scotia	5 549 000	148 733	2.7
New Brunswick	7 344 000	240 480	3.3
Québec	154 068 000	4 440 661	2.9
Ontario	106 858 000	2 597 264	2.4
Manitoba	64 995 000	2 467 081	3.8
Saskatchewan	65 233 000	2 191 778	3.4
Alberta	66 119 000	10 957 925	16.6
British Columbia	94 931 000	3 307 875	3.5
Yukon	48 345 000	1 364 468	2.8
Northwest Territories	143 232 000	3 668 162	2.6
Nunavut	199 400 000	2 443 357	1.2
Total Canada	996 646 000	34 942 904	3.5
2001			
Newfoundland and Labrador	40 572 000	1 150 379	2.8
Nova Scotia	5 549 000	124 930	2.3
New Brunswick	7 344 000	228 016	3.1
Québec	154 068 000	4 681 819	3.0
Ontario	106 858 000	2 950 928	2.8
Manitoba	64 995 000	3 514 878	5.4
Saskatchewan	65 233 000	2 368 499	3.6
Alberta	66 119 000	8 264 028	12.5
British Columbia	94 931 000	3 306 200	3.5
Yukon	48 345 000	1 177 872	2.4
Northwest Territories	143 232 000	3 229 957	2.3
Nunavut	199 400 000	2 101 425	1.1
Total Canada	996 646 000	33 098 931	3.3

Sources: Natural Resources Canada; provincial/territorial mining recorder offices.
Note: Data for Prince Edward Island are excluded.

Figure 14

Off-Mine-Site Exploration and Deposit Appraisal Expenditures Per Hectare of Claims in Good Standing, by Province and Territory, 2000 and 2001



Sources: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures; provincial/territorial mining recorder offices.
Notes: Off-mine-site exploration and deposit appraisal expenditures include costs incurred off-mine-site for field work and overhead plus engineering, economic and feasibility studies, environment and land access costs. "Claims in good standing" excludes mining leases. Data for 2000 and 2001 are final.

1.6 EVALUATION OF RECENTLY INTRODUCED TAX CREDITS FOR MINERAL EXPLORATION

The downturn in exploration and deposit appraisal spending that began in 1997 led to a considerable weakening of Canada's famed junior mining sector, to a significant reduction in the country's reserves of gold and base metals, and to consequent mine closures and job losses. Affected stakeholders (mining industry, communities, provinces/territories) asked the federal government for a tax incentive and it responded with the October 2000 introduction of the three-year, 15% non-refundable federal Investment Tax Credit for Exploration (ITCE) for investors in flow-through shares of exploration and mining companies.

In addition to already existing measures and to recently introduced non-tax-based programs (see Section 2 of this report), some provinces/territories also chose to further encourage mineral exploration with tax-based incentives and introduced their own measures before and after the launch of the federal ITCE. Ontario, Saskatchewan, British Columbia and Manitoba chose to harmonize their tax credits with the structure of the federal ITCE. Québec selected a refundable tax credit at the corporate level and the Yukon increased the rate of its refundable corporate and personal income tax credit. All of these measures are further described in the respective provincial/territorial reviews of activities that appear in Section 2 and are described in detail on the web sites of the ministries/departments responsible for mining in each of the above-mentioned provinces/territories.

For the governments involved, the temporary nature of these incentives dictated that their effectiveness be evaluated prior to their termination dates. A working group was thus created under the auspices of the Intergovernmental Working Group on the Mineral Industry (IGWG) to report to the 2002 Mines Ministers' Conference in Winnipeg, Manitoba. This working group, comprising representatives from the governments of Québec, Ontario, Manitoba, Saskatchewan, British Columbia, the Yukon and the Northwest Territories, and from Natural Resources Canada, submitted a preliminary report to Canada's Mines Ministers and a study of options for improvement or replacement to Finance Canada.

The working group found that the ITCE and related provincial/territorial tax credits had been reasonably successful in maintaining access to exploration financing for junior companies in difficult economic and financial times. The timing of the introduction of the harmonized provincial tax credits and the time it took for industry and investors to adjust to these various programs led to an initially slow uptake on the part of investors. The situation has improved and there are now signs that the program is realizing its anticipated potential. In fact, it has been determined by Natural Resources Canada, through an analysis of publicly available company press releases, that flow-through financing, which is an important financing mechanism for junior mining companies, amounted to $63 million in 2000, $110 million in 2001 and approximately $200 million in 2002 (preliminary). Furthermore, data obtained from the Canada Customs and Revenue Agency confirm that virtually all of the expenditures resulting from these flow-through financings were incurred for work that qualifies for the ITCE and harmonized provincial tax credits.

The main recommendations of the working group were that the ITCE and the harmonized provincial tax credits be extended for at least another year and that the period to spend funds on exploration work (the "look-back" period) be extended to one full year after the program's proposed closing date. These recommendations were endorsed by the Mines Ministers and submitted to respective federal and provincial Finance Ministers for their consideration in the processes leading up to their 2003/04 budgets.

1.7 SHORT-TERM OUTLOOK FOR EXPLORATION AND DEPOSIT APPRAISAL SPENDING IN CANADA

The three indicators (spending, drilling and claim staking) of exploration and deposit appraisal activity analyzed in this chapter reveal that the downward trend that began in 1997 has most likely come to a halt. In fact, were it not for a forecast decline of spending in 2002, it could have been clearly stated that Canadian exploration and deposit appraisal expenditures are slowly returning to more adequate levels. Instead, it remains difficult to predict spending, even if only for the near future.

Still, a number of positive factors can lead to some optimism for 2003 exploration and deposit appraisal activity. For one, the junior mining sector has been getting stronger and should continue to benefit from the fact that investors are becoming more familiar with recently introduced tax credits. The problem is that many of these tax credits are scheduled to lapse at the end of 2003 unless extensions are announced by respective governments.

Geopolitical uncertainty can have both negative and positive effects on the mineral exploration industry. In recent months, the price of gold has certainly been influenced in a positive manner as far as exploration and mining companies are concerned. If sustained, this development should provide an impetus for gold exploration and deposit appraisal by both junior and senior mining companies. The latter, which have seen their overall spending decrease in recent years, are likely to increase spending at suspended or closed gold mining operations and this should reflect positively on the 2003 exploration and deposit appraisal totals.

The search for diamonds also continues to bring good news to the Canadian mining scene. The presence of highly visible projects across the country and in all of the three work phases (exploration, deposit appraisal and mine complex development) is helping ensure that diamonds will remain a commodity of choice for Canadian explorationists over the coming years.

Based on the above factors, it would seem appropriate to call for a moderately positive short-term outlook for Canadian exploration and deposit appraisal activities.

2. Regional Outlook

2.1 INTRODUCTION

This section presents comments from provincial and territorial officials on recent exploration and deposit appraisal activities in their respective jurisdictions and indicates their expectations for 2002.

The reader should note that some provinces/territories, in their respective review of activities, use the term "exploration" in its broad sense; that is, it includes both exploration (grass-roots) and deposit appraisal (advanced) components. The expenditure data mentioned by the different provincial and territorial authorities may also differ from those reported in Chapter 1 (official federal-provincial/territorial figures released by NRCan) because some of these jurisdictions use different criteria or definitions in their own analyses.

2.2 NEWFOUNDLAND AND LABRADOR[1]

Overview

Expenditures on mineral exploration in Newfoundland and Labrador in 2001 totaled $28.4 million, a 6% increase over the 2000 level (**Table 10**). The Voisey's Bay discovery created an exploration boom that peaked in 1996 with an expenditure of $92.5 million. The following four years saw a steady decline in exploration activity for nickel in Labrador. The 2001 figure of $28.4 million, combined with a similar forecast for 2002, indicate that exploration levels have stabilized.

Base metals were the primary exploration target, accounting for 80% of total expenditures, followed by industrial minerals (11%) and gold (9%). Base-metal and industrial mineral expenditures in Labrador exceeded those in insular Newfoundland by around 2:1. The majority of exploration for gold is concentrated on insular Newfoundland.

In 2001, claims in good standing held steady at 47 306 whereas claim staking increased by 20% to 15 665. Diamond drilling activity declined by 35% in 2001 to 47 176 m. A forecast increase in claim staking to around 33 126 for 2002 will result in a 45% increase in claims in good standing for that year. As well, it is forecast that levels of diamond drilling will increase in 2002.

In Labrador, the 2001 expenditures reflect renewed interest in base metals and platinum group elements (PGE), including a $13 million program by Voisey's Bay Nickel Company Limited for nickel-copper-cobalt at Voisey's Bay, and a major exploration program for iron ore in western Labrador by Iron Ore Company of Canada. On the island, established base-metal programs in central Newfoundland were supplemented by the Noranda Inc.-Cornerstone Resources Inc. joint venture in eastern Newfoundland, and Altius Resources Inc. initiated a major epithermal gold exploration

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[1] The Newfoundland and Labrador review of activities was prepared by Ges Nunn. For more information, the reader is invited to contact Mr. Nunn by telephone at (709) 729-6418 or by e-mail at gesnunn@mail.gov.nf.ca.

TABLE 10. NEWFOUNDLAND AND LABRADOR EXPLORATION STATISTICS, 1995-2002

	1995	1996	1997	1998	1999	2000	2001 (p)	2002 (f)
					(dollars)			
Exploration expenditures	71 100 000	92 546 708	71 752 000	50 868 000	32 353 000	26 806 992	28 441 725	28 000 000
					(number)			
Claim staking (1)								
Claims staked	248 707	15 299	13 363	14 476	9 643	12 969	15 665	33 126
In good standing	280 750	168 815	126 766	86 955	57 431	46 124	47 306	66 264
					(dollars)			
Exploration field expenditures								
Base metals	64 226 300	83 737 940	61 420 000	35 289 730	25 000 000	19 246 046	22 585 446	20 000 000
Precious metals (gold)	5 371 500	6 395 873	5 228 072	3 213 618	4 767 000	6 381 634	2 720 449	5 500 000
Other	1 241 000	2 412 895	2 336 828	12 366 652	2 586 000	1 179 312	3 135 830	2 500 000
					(metres)			
Diamond drilling (2)								
Production/development	8 107	9 424	13 318	4 967	4 168	6 920	7 721	..
Exploration	120 803	226 208	141 320	90 428	112 095	67 626	39 455	..
Total diamond drilling	128 910	235 632	154 638	95 395	116 263	74 546	47 176	..

Source: Newfoundland and Labrador Department of Mines and Energy.

.. Not available; (f) Forecast; (p) Preliminary.

(1) Total claims staked and total claims in good standing updated on December 31, 2002. (2) Based on a special diamond drilling survey.

project in the Botwood Basin in north-central Newfoundland. The latter, and a December 2001 announcement that Barrick Gold Corporation had entered into an earn-in joint venture on many of Altius's Botwood Basin claims, helped spark a staking rush for gold throughout much of central Newfoundland. The increased staking activity and resulting exploration programs are expected to have a significant positive effect on gold exploration for 2002 and 2003.

Mining

Richmont Mines Inc. suspended production at its Baie Verte Nugget Pond gold mine in December 2001; however, mining had commenced at its Springdale area Hammerdown gold mine in July 2001. After a winter 2002 shut-down, the Nugget Pond milling operations resumed in March 2002 processing ore from the Hammerdown deposit.

In 2001, Torngait Ujaganniavingit Corporation began production at a second dimension stone anorthosite quarry, named Igiak, and prepared sample tiles at a potential fabrication plant in Hopedale, northern Labrador. The latter commenced production in 2002.

Atlantic Minerals Limited increased production at its Lower Cove limestone-dolomite quarry in 2002 following a major order for armour stone for a construction project in North Carolina, United States.

In March 2002, Beaver Brook Resources Limited purchased all of the mineral rights together with all surface infrastructure related to the Beaver Brook antimony mine. Beaver Brook plans to reactivate the mine in 2003.

No mining leases were issued in 2001. Applications for mining leases have been received from Voisey's Bay Nickel Company Limited for the Voisey's Bay deposit, Aur Resources Inc. for base metals at Duck Pond, Atlantic Minerals Limited for a new dolomite quarry at Lower Cove, and International Granite Corporation for dimension stone at Finger Pond.

Development-Stage Projects

On June 11, 2002, Inco Limited and the Government of Newfoundland and Labrador signed a "Statement of Principles" to develop the Voisey's Bay nickel-copper-cobalt deposits. On October 10, 2002, Inco announced its intention to complete a bankable feasibility study for the open-pit mine, mill and concentrator, and related infrastructure by the end of 2002. A $20 million advanced surface exploration program, including diamond drilling and ground geophysics, commenced in the summer of 2002 and is scheduled for completion in 2006. An open-pit mine at the Ovoid deposit and a 6000 tonne-per-day (t/d) on-site mill and concentrator will be constructed between 2003 and 2006 when open-pit mining is due to start. Underground exploration and deposit delineation, which will include diamond drilling and the sinking of exploration shafts, and feasibility studies will be completed in time for the potential transition from open-pit to underground mining. Industrial and Employment Benefits, and Impacts and Benefits agreements have been signed, respectively, with the Province and with the Innu Nation and the Labrador Inuit Association. Resources are currently 141 million tonnes (Mt) at an estimated grade of approximately 1.5% nickel.

On December 6, 2001, Aur Resources Inc. announced that it had entered into agreements of purchase and sale with Thundermin Resources Inc. and Queenston Mining Inc. to acquire the Duck Pond base-metal property in central Newfoundland. On January 31, 2002, the project received approval from the provincial Department of Environment. The completion of the purchase was announced by Aur on March 27, 2002. Current proven and probable resource estimates stand at 5.2 Mt grading 3.3% copper, 5.8% zinc, 0.9% lead, 59 g/t silver and 0.8 g/t gold.

Exploration Highlights - Labrador

From late 2001 through to the fall of 2002, Voisey's Bay Nickel Company Limited spent approximately $15 million on geotechnical surveys, including diamond drilling, lithogeochemistry and ground and downhole geophysics, and around $35 million on infrastructure at the Voisey's Bay site.

In January 2002, Donner Minerals Ltd. entered into a joint-venture agreement with Falconbridge Limited on regional exploration for Voisey's Bay-type deposits outside of the Voisey's Bay and South Voisey areas with Falconbridge Limited as operator.

At South Voisey, Falconbridge Limited completed geological mapping, surface and downhole geophysical surveys, three-dimensional modelling of geophysical data, and diamond drilling.

In the spring of 2002, staking over areas with nickel potential included: Ram Exploration Ltd. at Snegamook Lake in central Labrador (1000 claims), Celtic Minerals Ltd. west of Voisey's Bay (338 claims), International Silver Ridge Resources Inc. west of Voisey's Bay (68 claims), and Hudson Bay Exploration and Development Company Ltd. in the Kingurutik River area of northern Labrador (190 claims). In addition, Cornerstone Resources Inc. optioned property in the Kingurutik River area.

In the summer of 2002, BHP Billiton Diamonds Inc. staked 2181 claims over the Shabogamo Gabbro in western Labrador for nickel and PGE. A joint venture with Gallery Resources Limited was announced on July 8, 2002. An airborne geophysical survey was completed in July 2002 and follow-up mapping and prospecting were completed in the fall of 2002.

Iron Ore Company of Canada completed geological and airborne geophysical surveys in western Labrador. Follow-up to ground geophysical, geological and diamond drilling programs is ongoing.

Also in western Labrador, Ressources Majescor Inc. commenced grass-roots exploration for diamonds.

Exploration Highlights - Newfoundland

Since late 2001, exploration activity in Newfoundland has focussed on its gold potential.

In October 2001, Altius Resources Inc. staked 855 claims in north-central Newfoundland to expand its sediment-hosted, low-sulphidation, epithermal gold "Botwood Basin project." The claims lie along the northeasterly Mustang trend and along the northwesterly Miguel trend. On December 12, 2001, Altius Resources Inc. announced a joint venture on the Mustang trend claims with Barrick Gold Corporation to target "Carlin-type" gold deposits.

Initially, the ensuing staking rush was concentrated in a belt from northeastern Newfoundland to the Bay d'Espoir area on the island's south coast and involved some 13 500 claims over the four-month winter period. Prominent in this (with total claims staked) were: Rubicon Minerals Corporation (3870 claims), particularly northwest of Gander and around Benton in the northeast; Altius Resources Inc. (1516 claims) throughout the Botwood Basin and near St. Alban's in the south; Kevin D. Keats and associates (734 claims), South Coast Ventures Inc. (581 claims), Moydow Mines International Inc. (570 claims), the Quinlans (485 claims), Mackenzie Jaims (407 claims), CanAlaska Ventures Ltd. (400 claims), Perry English (395 claims), Black Bart Prospecting Inc. and associates (344 claims), and VVC Exploration Corp. (339 claims) throughout the Botwood Basin; and Vulcan Minerals Inc. (490 claims) and Alexander J. Turpin (234 claims) near Bay d'Espoir.

Within this area, in April 2002, Barrick Gold Corporation extended its agreement with Altius Resources Inc.; Candente Resource Corp. entered the play with an option on the Linear property near Gander; Cornerstone Resources Inc. acquired the True Grit property near St. Alban's; and Grayd Resource Corporation optioned the 608-claim Glenwood property, west of Gander, from South Coast Ventures Inc. In May 2002, Candente obtained one of the larger land positions with an option on 734 claims spread over 10 properties throughout the Botwood Basin and, in June 2002, further increased its land holdings by staking 612 claims in the area of the Linear property following the discovery of several new visible gold showings.

Elsewhere on the island during the same period, Cornerstone Resources Inc. optioned the 108-claim Colchester copper-gold property at Green Bay from Alexander J. Turpin; John Lee Carroll staked 347 claims in the vicinity of the former Rambler copper-gold mines on the Baie Verte Peninsula; Kiex Consulting Limited, on behalf of Rubicon Minerals Corporation, staked 1474 claims to explore for Carlin-type gold deposits on the Great Northern Peninsula; and Vulcan Minerals Inc. staked 255 claims for salt and potash on Newfoundland's west coast.

In June 2002, Kermode Resources Ltd. announced an agreement with South Coast Ventures Inc. at Jackson's Arm, White Bay, where gold mineralizing systems occur in granites and the overlying sediments; Alexander J. Turpin staked 400 claims in the vicinity of the Cape Ray gold deposit in southwestern Newfoundland and 241 claims around the Colchester property; and GeoVector Management Inc. staked 134 claims near the Hickey's Pond gold prospect on the Burin Peninsula. Alexander J. Turpin has optioned both the Cape Ray and Colchester properties to Cornerstone Resources Inc. Cornerstone Resources Inc. subsequently entered into an agreement on the latter property with Sudbury Contact Mines Limited. Cornerstone also has agreements in place with Candente Resource Corp. on its central Newfoundland Paul's Pond and Island Pond properties. In June 2002, Altius Resources Inc. entered into an agreement with CanAlaska Ventures Ltd. on its Miguel trend claims and GlobeNet Resources Inc. commenced exploration at Cape Ray.

In July 2002, South Coast Ventures Inc. staked 238 claims covering several gold prospects on the Baie Verte Peninsula. These claims have been optioned to Grayd Resource Corporation. The gold exploration impetus was maintained by a series of announcements by Rubicon Minerals Corporation. In July 2002, it reported six grab sample results from visible gold-bearing float of between 18.2 g/t and 353.4 g/t gold from an area midway between Buchans and Grand Falls in central Newfoundland. The company also reported a number of distinct boulder trains containing visible gold located in the same general area. During this time, Rubicon increased its holdings in the area, through staking and option, to 2308 claims.

Also in the summer of 2002, Mountain Lake Resources Inc. fulfilled its spending requirements for a 50% interest in the Valentine Lake gold property in central Newfoundland and announced an agreement to acquire full ownership from Noranda Inc.; Cornerstone Resources Inc. announced a major project in the Green Bay area centred around the Colchester property; and Candente Resource Corp. reported five new visible gold showings from a 3-km-long zone on New World Island, in northeastern Newfoundland, that yielded up to 127 g/t gold.

At the Moosehead property joint venture between Altius Resources Inc. and Sudbury Contact Mines Limited, near Bishop's Falls in north-central Newfoundland, Altius Resources Inc. completed several phases of diamond drilling during 2002. Results from this bonanza-type, epithermal gold prospect include uncut assays of 111.97 g/t gold over 2.02 m, which contains 0.18 m of 1154.35 g/t gold. Structural studies and an airborne geophysical survey were also completed in 2002 and additional diamond drilling is planned. As well, Altius Resources Inc. also completed diamond drilling on its Pilley's Island base-metal joint-venture property with Inmet Mining Corporation.

The principal areas of ongoing base-metal exploration are summarized below.

In July 2002, Skygold Ventures Ltd. announced an option on Island-Arc Exploration Inc.'s Long Lake base-metal property in central Newfoundland.

At the Cornerstone Resources Inc.-Noranda Inc. joint venture on the Red Cliff stratabound copper property, on the Bonavista Peninsula in eastern Newfoundland, diamond drilling resumed in August 2002. Diamond drilling results include up to 1% copper and 12.1 g/t silver over 14.25 m. Noranda Inc. had expended over $1 million on the project up to late 2002. Cornerstone Resources Inc. is also investigating the iron oxide-copper-uranium-gold-silver-rare earth potential of its nearby Princess property group.

In the spring of 2002, Hudson Bay Exploration and Development Company Ltd. completed a diamond drilling program on the 600-claim Green Bay base-metal property near Springdale. Subsequently, however, it withdrew from its option on the property with Major General Resources Ltd. (now Commander Resources Ltd.).

In June 2002, Altius Resources Inc. announced an earn-in agreement with Cameco Corporation on its 150-claim Rocky Brook property in western Newfoundland. The property contains unsourced boulders of Carboniferous sedimentary rocks rich in uranium (up to 11.5% U_3O_8), silver (up to 29 448 g/t) and gold (up to 17.8 g/t).

In 2002, exploration programs by Gallery Resources Limited on its Katie base-metal property in central Newfoundland uncovered evidence of an epithermal gold system.

Government Incentives

The Government of Newfoundland and Labrador's overall annual contributions to the Junior Company Exploration Assistance Program ($1.75 million), the Prospectors Assistance Program ($250 000) and the Dimension Stone Incentive Program ($250 000) remained unchanged in 2001-02. However, the flexibility to move funds from one program to another was introduced.

In 2001, 97 prospectors received assistance from the Prospectors Assistance Program. Advanced prospectors' assistance of up to $10 000 remains available under the program. In 2002, 100 prospectors received assistance.

In February 2002, a dimension stone working committee was formed. The committee contains representatives of various provincial government departments together with the Atlantic Canada Opportunities Agency and the Newfoundland and Labrador Chamber of Mineral Resources.

Legislative Changes

In May 2001, the Mealy Mountains region in southeastern Labrador was declared an Exempt Mineral Land and a joint federal-provincial study was initiated on a proposed national park for the area.

As well, the Mineral Lands Division of the Department of Mines and Energy is proceeding towards the establishment of on-line staking. Several legislative and regulatory amendments are required to facilitate the procedural changes associated with on-line staking and a late summer 2003 start-up is scheduled.

2.3 NOVA SCOTIA[2]

Exploration Highlights

Exploration expenditures in Nova Scotia have declined steadily for several years, from approximately $6.9 million in 1996 to a forecast of $2.0 million for 2002 (**Table 11**). This trend mirrors the overall expenditure patterns for Canada by both junior and senior mineral exploration companies.

TABLE 11. NOVA SCOTIA MINERAL EXPLORATION STATISTICS, 1995-2002

	1995	1996	1997	1998	1999	2000	2001 (p)	2002 (f)
Exploration expenditures (field + overhead) ($)	2 843 000	6 892 000	6 726 000	4 835 112	3 600 000	3 700 000	3 500 000	2 000 000
Claim staking (new and renewed) (general + special licences) (no. of claims)	16 407	34 265	26 403	9 640	14 240	9 624	8 030	12 315
Exploration diamond drilling (metres)	8 000	15 600	26 487	20 297	16 860	8 200	5 100	5 007

Source: Nova Scotia Department of Natural Resources
(f) Forecast, (p) Preliminary

Exploration in 2002 has focused on a variety of industrial mineral commodities, including titanium-bearing heavy mineral sands, kaolin and silica sand, barite, quartz, gypsum, aggregate, limestone and dolomite, in addition to base- and precious-metal commodities.

At the end of 2001, the total area under exploration licence in Nova Scotia, including new and re-issued claims and special licences, was approximately 130 970 ha (8030 claims), down approximately 17% from 157 000 ha (9624 claims) in 2000. This represents the lowest area under licence in the past 10 years, down substantially from the recent high of more than 500 000 ha (34 265 claims) in 1996. Renewed interest in the gold potential of the Meguma zone of southern Nova Scotia, however, has led to a significant forecast increase for 2002 of 200 860 ha (12 315 claims).

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[2] The Nova Scotia review of activities was prepared by Michael MacDonald. For more information, the reader is invited to contact Mr. MacDonald by telephone at (902) 424-2523 or by e-mail at mamacdon@gov.ns.ca.

Drilling in 2001 totaled approximately 5100 m. The forecast for 2002 is 5000 m. Both estimates are significantly lower that the recent maximum of 34 265 m in 1996. Drilling activities in 2001 and 2002 focused on industrial mineral, gold and base-metal commodities.

New Mines

Georgia Pacific Corp. commenced mining activities at its Melford surface gypsum mine in south-central Cape Breton Island in the fall of 2002. The deposit has a combined proven and probable mineable reserve of 35 Mt of gypsum.

Development-Stage Projects

MacLeod Resources Limited has received all the necessary permits required to bring its Kennedys Big Brook marble quarry into production. To date, test blocks of red and blue marble have been extracted and the company is conducting test processing and market evaluation.

Black Bull Resources Inc. received Environmental Assessment approval for its White Rock quartz project on September 6, 2002. The company plans to commence development of a quartz extraction and processing operation at its site near Yarmouth, with production expected to commence in early 2003 once all required permits have been issued. The company has defined a mineral resource of 16 Mt of quartz over a strike length of 1.6 km.

Titanium Corporation Inc. continues to evaluate its titanium-bearing heavy mineral sands project in the Shubenacadie River. Following an announcement in February 2002, the company constructed a small pilot testing plant in partnership with the Minerals Engineering Centre at Dalhousie University. Recent exploration activities include a 60-hole drilling project and the collection of a 16-t bulk sample for test processing.

Exploration Projects

There has been renewed interest in the gold deposits of the Meguma zone of southern Nova Scotia in recent months. In July 2002, Aurogin Resources and Moose River Resources announced finalization of an agreement for the Touquoy sediment-hosted gold deposit. On October 16, 2002, Aurogin released the results of its due diligence work on the Moose River gold project, including drilling, geochemistry and metallurgical testing. Highlights from the company's drilling included: 2.0 g/t gold over a 77.2-m interval in the Main zone, 1.1 g/t gold over a 13.6-m interval in the East zone, and 3.3 g/t gold over 10.8 m in an area between these two zones. The known resources include 3.8 Mt indicated resources at 2.22 g/t gold (274 000 oz) and 1.9 Mt inferred resources at 2.15 g/t gold (131 000 oz).

On May 6, 2002, Tempus Corporation announced plans to acquire six gold properties in the Meguma zone, including the Forest Hill, Beaver Dam, Cameron Dam, Killag, Upper Seal Harbour and Ragged Falls properties, from Votix Corporation Limited and Portree Inc., subject to a due diligence review by Tempus.

Coventry Charter Corporation announced in May 2002 that it had acquired the assets of Monster Copper Resources Ltd., including 1282 claims bounding the Cobequid-Chedabucto fault zone, which divides northern and southern Nova Scotia, and that it planned to explore for iron oxide-copper-gold-style mineralization.

Champlain Resources Inc. conducted prospecting and diamond drilling to evaluate the industrial mineral and base-metal potential of the Brazil Lake pegmatite dykes near Yarmouth.

Asedex Minerals Corporation Inc. conducted prospecting, and rock and till geochemistry, to evaluate the base-metal potential of granitic rocks in the East Kemptville area of Yarmouth County.

Several companies continue to evaluate the viability of salt dome structures for underground gas storage in light of offshore gas exploration, development and production in Nova Scotia. These interests have focused on structures near the Maritimes and Northeast Ltd. pipeline that extends from Goldboro on the Atlantic coast through central and northern Nova Scotia to New Brunswick and New England. On February 28, 2002, Statia Terminals Canada Incorporated, which holds rights to several salt domes in Cape Breton Island, was purchased by Kaneb Pipe Line Partners. Kaneb is the third largest independent liquids terminal operator in the United States. Statia continues to evaluate the salt deposit in Port Richmond. Other companies evaluating geostorage in salt deposits include Intragaz and Company Limited Partnership, which is exploring in the McIntyre Lake and Kingsville areas of Cape Breton Island, and Geostorage Associates, which is exploring near Stewiacke on mainland Nova Scotia. In addition, Intragaz has received two new special licences near Roslin, Cumberland County, and Grand Anse, Richmond County.

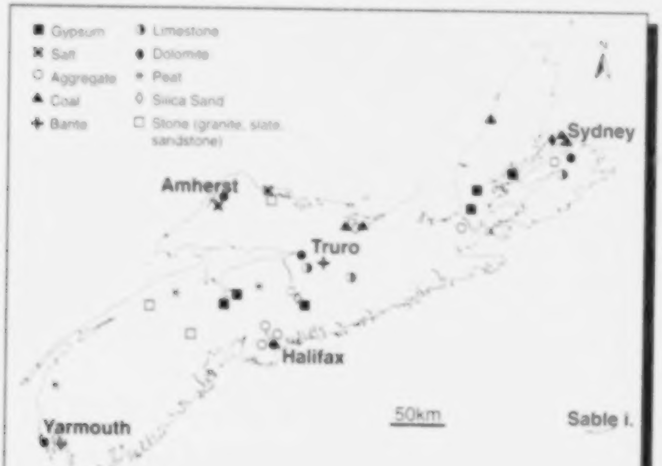
Mineral Production

The estimated value of Nova Scotia mineral production for 2001 was $316 million, a slight increase over the 2000 production value of $310 million. Gypsum has replaced coal as Nova Scotia's largest mineral product following the closure of the underground coal mines on Cape Breton Island. Gypsum production from five open-pit mines in 2001 (**Figure 15**) was valued at $79 million, up slightly from $76 million in 2000, whereas the value of coal production dropped from $74 million in 2000 to $65 million in 2001. Coal production in 2002 will be entirely from five small surface operations, with an estimated production of 0.3-0.4 Mt, a substantial drop from recent years. This will undoubtedly reduce the total mineral production value for 2002.

Salt production from the underground mine at Pugwash and the brining operation at Nappan increased from a total value of $54 million in 2000 to $65 million in 2001, up 20%.

Production of construction aggregates, including both crushed stone and sand and gravel, also remained relatively constant with a total estimated value of approximately $48 million in 2001. Approximately 2.5 Mt were shipped to export markets in the eastern United States and Caribbean regions.

Figure 15
Active Mines in Nova Scotia, 2001 and 2002



Source: Nova Scotia Department of Natural Resources.

Cement shipments from the LaFarge plant near Brookfield were valued at $43 million, up slightly from $40 million in 2000. Other mineral commodities produced in 2001 and 2002 included: barite (for pharmaceutical applications), limestone (for agricultural applications), dolomite (exported for metallurgical applications), agricultural peat, silica sand, clay (for the manufacture of bricks), and dimension stone (slate, sandstone, granite).

2.4 NEW BRUNSWICK[3]

Exploration Highlights

In 2002, the New Brunswick exploration sector experienced the effects of a global shift in target areas when activity levels reached the lowest level in several years, primarily due to the departure from the Bathurst Mining Camp of the exploration arm of Noranda Inc. Exploration expenditure surveys conducted for New Brunswick in 2002 indicate that approximately $3 million (current dollars) ($9.4 million in 2001) was spent in the province on exploration projects. **Figure 16** shows exploration trends as expressed by monies spent on exploration projects in New Brunswick over the past 13 years.

A similar but smaller downward trend was noted in the number of new claims recorded in the province. In 2002, 2118 claims were recorded in comparison to the 2232 claims that were recorded in 2001, a 5% decrease.

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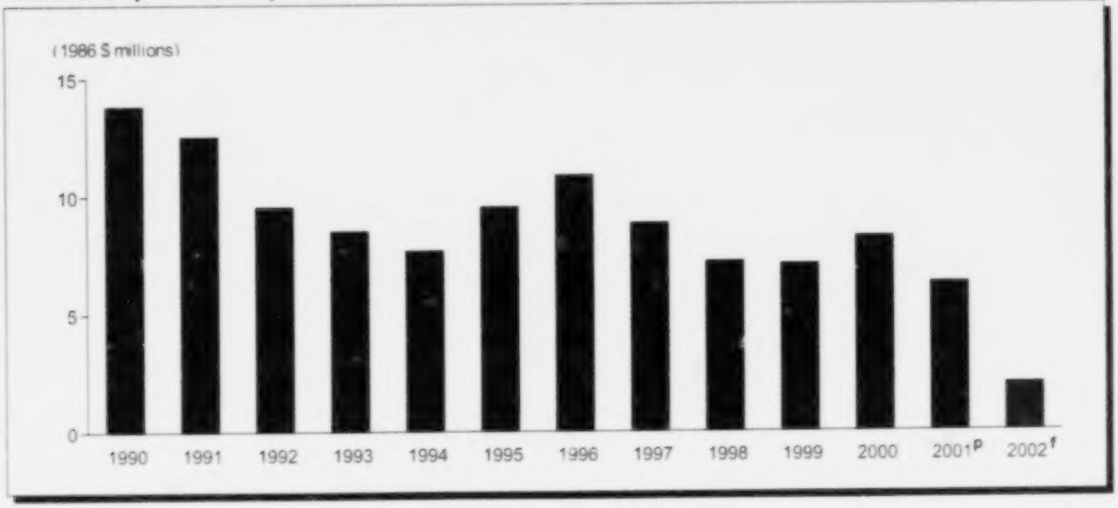
[3] The New Brunswick review of activities was prepared by Don J.J. Carroll. For more information, the reader is invited to contact Mr. Carroll by telephone at (506) 453-2206 or by e-mail at Don.Carroll@gnb.ca.

Figure 16
Mineral Exploration Expenditures in New Brunswick, 1990-2002



Source: New Brunswick Department of Natural Resources and Energy
f Forecast of intentions; p Preliminary.
Note: General plus mine-site expenditures (includes overhead costs)

Metallic Minerals

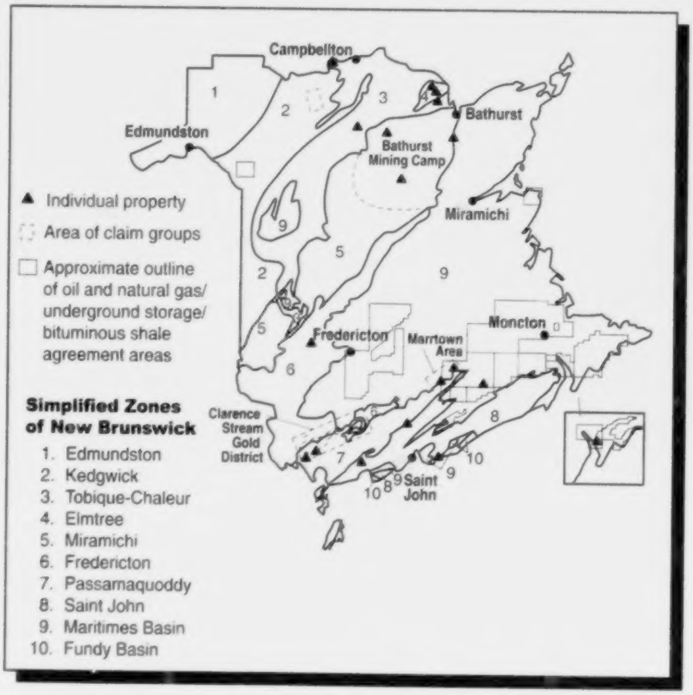
For the first time in several years, the bulk of exploration activity in New Brunswick was carried out in southern New Brunswick rather than in the northern region (**Figure 17**). The key reason for this change in focus was gold in the Clarence Stream area of southwestern New Brunswick and the Marrtown area of south-central New Brunswick. Junior companies, local exploration companies and prospectors have spent in excess of $2 million in the region expanding the resources of known gold deposits and searching for new ones. Work in 2002 has confirmed that gold is widespread and occurs in a variety of settings throughout the region, signifying the emergence of a new gold district.

Freewest Resources Canada Inc. has led the exploration effort in the Clarence Stream area, where it has established that intrusion-related gold occurrences abound. The company also discovered high-grade zones around Anomaly A that occur more than 3 km northwest of the initial discoveries. Freewest has commissioned a preliminary scoping study of the property to assist with exploration and future development of this gold resource.

Other junior companies working in the Clarence Stream area include Union Gold Inc., Fancamp Resources Ltd., Golden Hope Mines Limited, Murgor Resources Inc, and PGE Resource Corporation. During a drilling program, Union Gold Inc. intersected mineralized structures that yielded anomalous gold values.

Local prospectors, including William Gardiner, Emilio Doiron, Perry English, Raymond Thorn, David O'Neill, David Stevens, Peter Fenety, Kim Reeder, and Karen McKay, have been active in the area. David Stevens and Kim Reeder discovered additional high-grade gold mineralization at

Figure 17
Highlighted Exploration Properties in New Brunswick, 2002


Campbellton
Edmundston
Bathurst
Bathurst Mining Camp
Miramichi
Fredericton
Marrtown Area
Moncton
Clarence Stream Gold District
Saint John
1
2
3
5
6
7
8
9
10
▲ Individual property
⬚ Area of claim groups
☐ Approximate outline of oil and natural gas/ underground storage/ bituminous shale agreement areas
Simplified Zones of New Brunswick
1. Edmundston
2. Kedgwick
3. Tobique-Chaleur
4. Elmtree
5. Miramichi
6. Fredericton
7. Passamaquoddy
8. Saint John
9. Maritimes Basin
10. Fundy Basin

Source: New Brunswick Department of Natural Resources and Energy.

Waweig. It appears to be associated with the same structural zone that hosts Freewest Resources Canada Inc.'s Main zone, 20 km along strike to the northeast.

In the Cape Spencer area south of Saint John, high-grade and potentially extensive gold-bearing zones were discovered by Emilio Doiron working in conjunction with Raymond Thorn and Mark McNamara. Drill targets have been identified.

Emilio Doiron also discovered high-grade gold in the Marrtown area north of Sussex, which resulted in intensive exploration by junior companies, local exploration companies and prospectors. Pathfinder Resources Ltd. followed up geophysical and geochemical programs by conducting a drilling program that yielded lower-than-expected grades. Several new occurrences and indications of additional high-grade zones have been found in the area and work continues.

In the Springfield area northwest of Fredericton, a drilling program was initiated by TNR Resources Ltd. to investigate gold mineralization in strata adjacent to felsic intrusions of the Pokiok Batholith. This work by TNR Resources extended the known depth and strike length of an auriferous altered zone but failed to intersect high-grade gold mineralization. However, additional drilling is planned.

PGE Resource Corporation continued to explore the Annidale and New River areas, northeast and west of Saint John, respectively, for massive sulphides. Annapolis Valley Goldfields Inc. drilled two holes on its McKeel Lake rare-earth-element property where mineralization is associated with aplite dykes intruding alkali feldspar granite at surface. Grades were less than expected, but other potentially mineralized areas were delineated to the east of the drilled area.

Exploration activity in northern New Brunswick (**Figure 17**) has experienced a major downturn in 2002. Statistics indicate that only a small fraction of the previous year's exploration expenditures was committed to this region in 2002. One of the main factors in decreased exploration investment in the Bathurst area was the closure of the Noranda Inc. exploration office in Bathurst.

Besides Noranda, several other major companies were not active during the year; however, CanZinco Ltd., Hudson Bay Exploration and Development Co. Limited, Phelps Dodge Corporation of Canada Ltd., and Teck Exploration Ltd. continued to hold land positions in northern New Brunswick.

The junior companies that collectively spent approximately half a million dollars on exploration include Annapolis Valley Goldfields Inc., Aurogin Resources Ltd., Heron Mines Limited, Montoro Resources Inc., Nicon Holdings Ltd., Northeast Exploration Services Ltd., Omni Mines Ltd., and PGE Resource Corp. All but one of these companies received funding under the New Brunswick Junior Mining Assistance Program.

Heron Mines Ltd. and joint-venture partner Aurogin Resources Ltd. accounted for more than half of the exploration expenditures in northern New Brunswick. After finding a new auriferous zone at Guitard Brook in 2001, they are evaluating the precious-metal potential of the contact aureole to the east of the Antinouri Lake Granite. About a dozen holes were drilled to test airborne geophysical anomalies from a survey flown in 2001.

Annapolis Valley Goldfields Inc. drilled two holes to look for northern extensions of the high-silver Nigadoo lode, without success. Montoro Resources Inc. conducted mapping and trenching on a cobalt property that yielded interesting assays. Nicon Holdings Ltd. drilled its Flatlands property to delineate the extent of a limestone body that had been discovered during routine mapping by Reginald Wilson (Geological Surveys Branch). Northeast Exploration Services Limited and PGE Resource Corporation drilled the Tower and Bills Lake properties, respectively, in search of sulphide mineralization.

Omni Mines Ltd. conducted additional ground geophysics and trenching on its property in the Simpsons Gulch-Boland Brook area in an attempt to find the source of the nickel-cobalt stream-sediment anomalies that are common there.

Nonmetallic Minerals

During 2002, the focus of industrial mineral exploration was on limestone and dolomite in northern and southeastern New Brunswick. Of particular interest, however, in the industrial minerals sector was the discovery of a potentially significant potash resource adjacent to the mine and milling operation of the Potash Corporation of Saskatchewan Inc. (New Brunswick Division) near Sussex.

Outlook

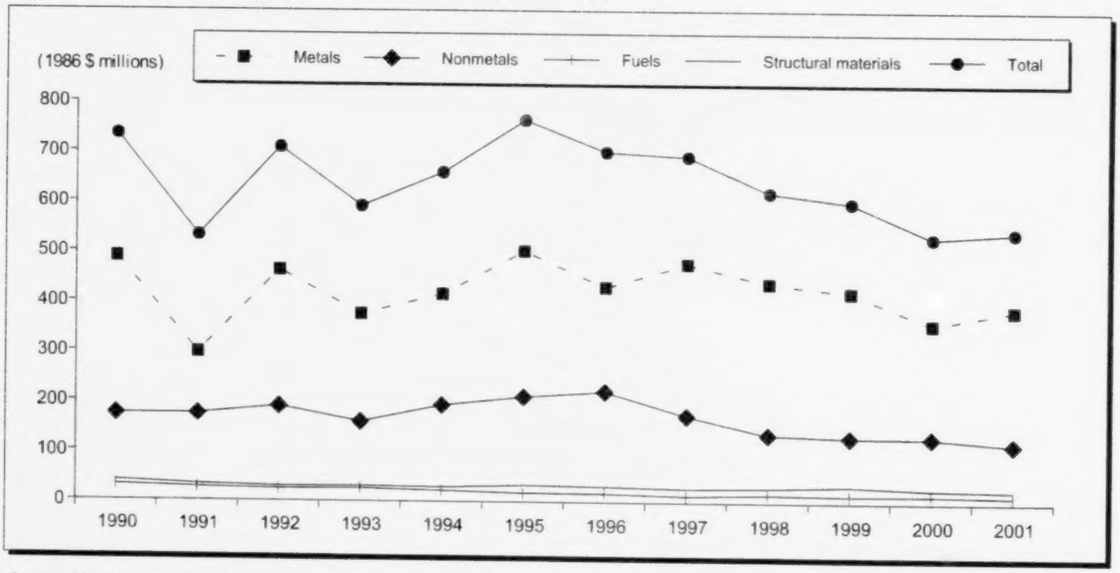
After experiencing average annual exploration expenditures in the order of $12 million per year for the past 10 years, New Brunswick in 2003 and for the near future is facing a major challenge, which is to attract new exploration investment to the province.

The outlook for 2003 is for activity in southern New Brunswick to remain high, the result of several new gold discoveries in 2002 in this region.

Mining Highlights

The 2001 value of mineral production (including coal) in New Brunswick is estimated to be $789 million, representing an increase of 2% from the final value of $773 million in 2000 (**Figure 18**). The increase was due to the improved performance of the metals sector. Higher production of zinc and lead was sufficient to overcome generally lower metal prices. Further support came from a weaker Canadian dollar, the value of which averaged US64.58¢ for the year, down 4% from the previous year when it averaged US67.34¢.

Figure 18
New Brunswick Mineral Production Values, 1990-2001



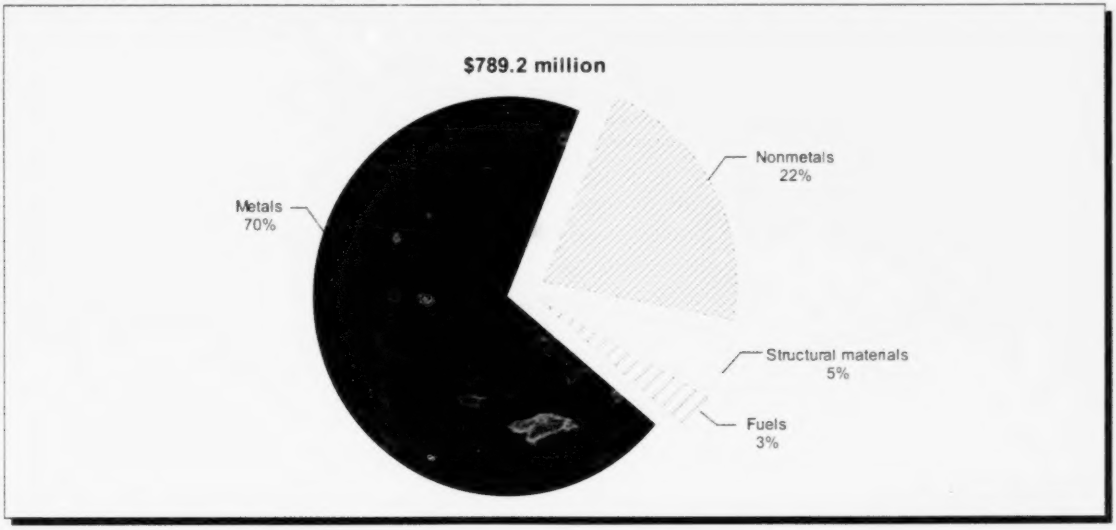
Source: New Brunswick Department of Natural Resources and Energy.

The value of metals production during the year was $562 million, representing 71% of the province's value of mineral production (**Figure 19**). Overall, the sector was up by 8%. Noranda's Brunswick mine, the province's sole metals producer, experienced a notable improvement in throughput and metal production. CanZinco's Caribou mine remained shut down for the third full year after low metal prices and metallurgical difficulties had forced a suspension of operations in August 1998.

Zinc continued to dominate the metals sector, with a value of $429 million, which represents 76% of the total value of metals. The value of zinc production increased approximately 8% from 2000. This is all the more remarkable as the zinc price actually fell by over 21% between 2000 (US51.2¢/lb) and 2001 (US40.2¢/lb). The drop in the average exchange rate of the Canadian dollar contributed to the value of production, as expressed in Canadian currency. Lead was a secondary contributor to the improvement in metals value as production increased by 24% while the price increased by 5% (US21.6¢/lb, up from US20.6¢/lb in 2000). The value of copper production fell by almost 13%, to $22 million, on the strength of a 13% decrease in the price (71.6¢/lb in 2001 vs. 82.2¢/lb in 2000) and a 5% decrease in production. Antimony, bismuth and cadmium continued to be produced as by-products from the Brunswick operation. The total value of the three by-product metals increased by 22%, chiefly because of increases in both the amount and price of bismuth produced. Gold production increased by 11.2%, resulting in a net increase in value despite a 2.9% drop in the price. Despite a slight increase in production, the value of silver fell by 4% as the result of an 11% decrease in the price.

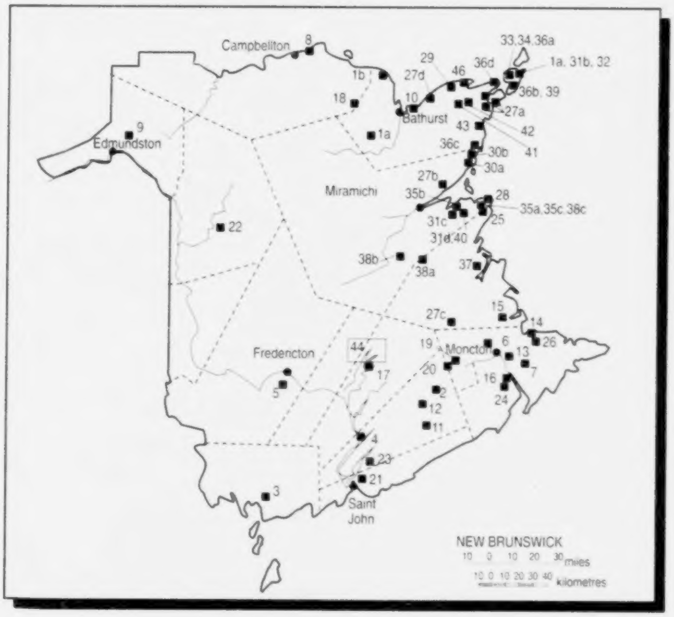
The nonmetals sector of the industry contributed $170 million (22%) to the value of mineral production, a 10% drop from the 2000 value. The largest contributor to the value of nonmetals production is potash. Both the value and quantity of potash decreased from 2000 levels. In addition to the regularly scheduled shut-down, the Potash Corporation of Saskatchewan's Penobsquis mine ceased production for six weeks in November to reduce excess inventory. Peat, the second largest contributor ($47 million) to the value of nonmetals production, represented 28% of the sector's value. After increases in the two preceding years, both the amount and value of peat fell. Salt and sulphur in smelter gas ranked next in value of production, with quartz and marl being minor contributors to the nonmetals sector.

Figure 19
New Brunswick Mineral Production Value, 2001



Source: New Brunswick Department of Natural Resources and Energy

Figure 20
Mines, Quarries and Peat Harvesting Operations in New Brunswick, 2002


Campbellton
8
33,34,36a
29
27d
46
36d
1a, 31b, 32
1b
36b, 39
18
10
27a
Bathurst
43
42
9
Edmundston
1a
36c
30b
41
30a
27b
Miramichi
35b
28
35a,35c,38c
31c
25
22
31d,40
38b
38a
37
15
27c
14
26
19
Moncton
6
13
44
Fredencton
20
7
17
16
5
2
24
12
11
4
23
21
3
Saint John
NEW BRUNSWICK
10 0 10 20 30 miles
10 0 10 20 30 40 kilometres

1a. Noranda Inc.-Brunswick Mine (Brunswick No. 12 mine); Zn, Pb, Cu, Ag
1b. Noranda Inc.-Smelter (Belledune smelter)
2. Potash Corporation of Saskatchewan Inc. (New Brunswick Division); potash, salt
3. North of Lake Digdeguash (Jamer Materials Ltd., pit operator); sand
4. Lafarge Construction Materials; sand and gravel
5. Springhill Construction Limited; crushed stone
6. Moncton Crushed Stone, a Division of Modern Construction Ltd.; crushed stone
7. Acadia Crushed Stone Division of Modern Construction Ltd.; MacDonald Paving and Construction Limited; crushed stone
8. Stewart Company Limited; crushed stone
9. Clarence Daigle et Fils Ltée; crushed stone
10. Chaleur Silica Ltd. (a Division of the Shaw Group); silica
11. Atlantic Silica Inc.; silica
12. Nelson Monuments Ltd.; dimension stone
13. Maritime Stone Works Inc.; dimension stone
14. Smith Cut Stone and Quarries Limited; dimension stone
15. Bastarache Stone Quarrie; dimension stone
16. T.P. Downey & Sons; dimension stone
17. Grand Lake Flagstone; dimension stone
18. Elmtree Resources Ltd.; limestone
19. Lafarge North America Inc.; limestone
20. Graymont (NB) Inc.; limestone
21. Brookville Manufacturing Ltd.; limestone, dolomite
22. Plaster Rock area (Daniel F. Merrithew); gypsum, limestone
23. Kingsway Materials Ltd.; aggregate
24. Albert Mines area (Ken Whaley); gypsum
25. ASB Greenworld Ltd.; peat
26. Beausejour Peat Moss Inc.; peat
27. Compagnie de Tourbe Fafard Ltée; peat: (a) Shippagan; (b) Burnt Church; (c) Birch Ridge; (d) Stonehaven
28. Good Earth Canada Ltd.; peat
29. Grande Anse Peat Moss Co. Ltd.; peat
30. Heveco Ltd.; peat: (a) Tabusintac; (b) Brantville
31. La Mousse Acadienne (1979) Ltée; peat: (a) Couteau Road; (b) Petit-Shippagan; (c) St. Margarets; (d) Eel River
32. La Tourbe de Pigeon Hill Ltée; peat
33. La Tourbière de Petit-Shippagan; peat
34. La Tourbière du Centre de l'Île Ltée; peat
35. Le Groupe Berger Ltée; peat: (a) St-Camille; (b) Bay du Vin; (c) St-Camille
36. Le Groupe Qualité Lamèque Ltée; peat: (a) Lamèque (b) Haut-Lamèque; (c) Rivière-du-Portage; (d) Pokesudie Island
37. Malpec Peat Moss Ltd.; peat
38. Premier Horticulture Ltée-Division Rogersville; peat: (a) south and (b) west of Rogersville; (c) Escuminac
39. Sun Gro Horticulture Canada Ltd.; peat
40. Theriault & Hachey Peat Moss Ltd.; peat
41. Tourbière 2000 inc.; peat
42. Tourbière L.M. ltée; peat
43. Tourbière Tracadie ltée; peat
44. N.B. Coal Limited; coal

Source: New Brunswick Department of Natural Resources and Energy.

The value of production for structural materials (lime, stone, sand and gravel) decreased 8% to $37 million. Sand and gravel production was up 3% while stone production decreased by more than 11%. These commodities provide the raw materials for the construction industry in New Brunswick.

The value of coal produced by N.B. Coal Limited in the Minto-Chipman area decreased by 13% to $20 million as production fell by 28%.

New Brunswick ranks first among Canadian provinces and territories in the value of production of zinc, lead, antimony and bismuth, second in silver and peat, and third in cadmium and sulphur (in smelter gas).

Current non-renewable mineral resource production (including coal and peat) is derived from 60 deposits: 1 base-metal, 1 potash, 1 coal, 2 silica, 6 dimension-stone, 5 limestone, 9 aggregate and 35 peat (**Figure 20**).

TABLE 12. EMPLOYMENT IN NEW BRUNSWICK'S MINERAL INDUSTRY, BY SECTOR, 2001

Sector	Number of Employees
Metals	1 531
Potash	371
Coal	82
Peat	1 071
Structural materials	135
Total	3 190

Source: New Brunswick Department of Natural Resources and Energy.

In 2001, the New Brunswick mineral industry employed an average of 3190 people. **Table 12** shows employment (permanent and seasonal) by sector in the mineral industry.

As reflected in the mineral production value trend graph for the past 10 years (**Figure 20**), for a variety of reasons, New Brunswick is experiencing a slow progressive decline in its value of mineral production.

Provincial Exploration and Development Initiatives

As part of New Brunswick's efforts to stimulate exploration activity, the Department of Natural Resources and Energy introduced the New Brunswick Junior Mining Assistance Program (NBJMAP) and the New Brunswick Prospector Development Program (NBPDP) in fiscal year 2001/02. These three-year programs have an annual budget of $600 000 ($350 000 for NBJMAP and $250 000 for NBPDP).

New Brunswick Junior Mining Assistance Program (NBJMAP)

The main objective of the program is to provide financial assistance to junior mining companies in order to increase the probability of finding economic reserves of mineral resources in New Brunswick. This program will provide up to 50% of the project cost to a maximum of $40 000 per company per year. The minimum amount available per project is $10 000. The remaining costs of the project will be borne by the applicant, either in cash or "in-kind" work. In 2001, the NBJMAP Review Committee reviewed 14 applications and recommended that 11 applicants receive assistance for a total of $350 000 whereas, in 2002, 13 applications were received and 11 applicants received similar financial assistance as in 2001.

New Brunswick Prospector Development Program (NBPDP)

The New Brunswick Prospector Development Program (NBPDP) was initiated in fiscal year 2001/02 with the same objectives and guidelines as the previous successful program. However, the program has been broken down into several elements: the New Brunswick Prospector Assistance

Program ($170 000), Prospector Training ($50 000), Prospector Rewards (up to $10 000), and Prospector Promotion ($20 000).

In 2001, the NBPAP Review Committee received 48 applications under the Prospector Assistance Program for funding and approved 46. Of the 52 applications received in 2002, 47 were approved for grants.

Special Projects

Another initiative aimed at stimulating exploration activity in New Brunswick was the implementation of a Targeted Geoscience Initiative (TGI) program between the Geological Survey of Canada and the New Brunswick Department of Natural Resources and Energy. Under the TGI project (Metallogeny of Intrusion-Related Gold Systems in Southern New Brunswick), efforts have focused on regional and detailed mapping, drill core logging and modeling in the Poplar Mountain and Clarence Stream areas of southern New Brunswick. The New Brunswick TGI project has enjoyed tremendous support from the private sector through logistical and monetary support and information transfer. In 2002, the TGI program included studies in the Tetagouche Lakes area of northern New Brunswick.

2.5 QUÉBEC[4]

A Destination of Choice for Mineral Exploration

Québec is well known for the value and diversity of its mining production – particularly in the areas of copper, zinc, iron, nickel, gold, niobium, ilmenite and titanium. For many decades, this production has formed the economic base for a number of regions. Recent discoveries of diamond-bearing kimberlite intrusions have once again confirmed the province's rich mineral potential. More than 90% of the vast surface area of Québec consists of Precambrian rocks, a geological setting that is known for hosting many world-class deposits.

Mineral explorationists will find support in Québec that is both varied and innovative, taking the form of ambitious geological mapping programs (Near North and Far North projects); generous financial assistance programs for exploration, deposit appraisal and mine development; tax measures that are not found elsewhere in Canada (notably a tax credit that is proportional to the exploration and deposit appraisal expenditures incurred by mining companies); and the existence of numerous venture capital funds.

The Ministère des Ressources naturelles (MNR) also provides explorationists with computer tools that are particularly useful because they make it possible to use the Internet to consult and purchase geoscientific information and to manage mineral exploration titles. Québec's geoscientific database is also very complete, easily accessible and can be rapidly queried via the *SIGÉOM à la carte* (www.mrn.gouv.qc.ca/mines/) interface. GESTIM, Québec's mining title management system enables users to designate and register mining exploration titles on-line and consult the public registry of mining rights at the following Internet address: www.mrn.gouv.qc.ca/mines/titres/.

At the 59th annual Mines Ministers' Conference held in Winnipeg in September 2002, the Prospectors and Developers Association of Canada awarded a National Claim Tag award to the

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[4] The Québec review of activities was prepared by Sylvain Lacroix, Jean Désilets, Pierre Marcoux, Pierre Doucet, Jocelyne Lamothe, Danielle Robert, Martin Dumas and Jean-Yves Chateauvert. For more information, the reader is invited to contact Mr. Lacroix by telephone at (418) 627-6296, ext. 5534, or by e-mail at sylvain.lacroix@mrn.gouv.qc.ca.

Government of Québec for its sustained and aggressive support of geoscience programs and for its innovative approach in financing mineral exploration and development.

Overview

In 2001, exploration and deposit appraisal expenditures totaled $102.9 million, representing an increase of $8.8 million (8.6%) over the previous year (**Table 13**). This recent increase was seen in both off- and on-mine-site expenditures. By way of comparison, exploration and deposit appraisal expenditures rose by 3.3% in Canada in 2001, while worldwide exploration spending declined by 15%. The recent increase in exploration and deposit appraisal spending indicates a reversal in the downward trend observed since 1997. Between 1997 and 2001, the share of world exploration capital spent in Québec rose from 2.4% to 3%.

Recent interest in diamond exploration is evident in the significant increase in annual diamond exploration expenditures in Québec. These expenditures did not exceed $2.6 million between 1997 and 1999, but rose above $7 million in 2000 and 2001. In these two years, Québec was the target of between 5% and 8% of Canadian diamond exploration expenditures and 2% of world expenditures in this area.

Drilling data compiled from drilling contractors indicate that a total of 617 833 m were drilled in 2001, an increase of 4% relative to 2000. The number of metres drilled in Québec had previously declined steadily from the 1 013 309 m drilled in 1996. For the first nine months of 2002, the number of metres drilled in 2002 seemed to be holding steady by comparison with the same period in 2001.

Public financing raised by the mining industry in the Québec capital market in 2001 for exploration projects in Québec totaled $29.8 million. This represents a $4.4 million increase (17%) over the $25.5 million raised in 2000. This increase is the result of an increase in funds raised through common shares and debentures, while the value of flow-through shares remained relatively stable at $10 million, a figure that nevertheless exceeds the $5.9 million raised in 1999.

TABLE 13. EXPLORATION FINANCING IN QUÉBEC, AND EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES (INCLUDING DIAMONDS) IN QUÉBEC, CANADA AND THE WORLD, 1997-2001

	1997	1998	1999	2000	2001
			($ millions)		
QUÉBEC					
Flow-through share issues	22.9	12.3	5.9	10.2	10.0
Common share issues and debentures				15.3	19.8
Exploration and deposit appraisal expenditures	173.3	127.1	113.5	94.1	102.9
On-mine-site	64.7	49.8	38.7	23.9	28.6
Off-mine-site	108.6	77.2	74.8	70.2	74.3
For diamonds	2.6	2.5	1.2	7.3	7.5
CANADA					
Exploration and deposit appraisal expenditures	921	655.9	504.3	496.7	512.9
Québec's share of total Canadian expenditures	18.8%	19.4%	22.5%	18.9%	20.1%
Exploration and deposit appraisal expenditures for diamonds	112.4	119.1	108.7	91.9	144.7
Québec's share of total Canadian expenditures for diamonds	2.3%	2.1%	1.1%	7.9%	5.2%
WORLD					
World exploration expenditures (US$ millions)	5 200	3 700	2 800	2 600	2 200
Québec's share of total world expenditures	2.4%	2.4%	2.7%	2.5%	3.0%
World exploration expenditures for diamonds (US$ millions)	332	328	280	250	245
Québec's share of total world expenditures for diamonds	0.6%	0.5%	0.3%	2.0%	2.0%

Sources: Service de l'imposition et des données minières (Québec Department of Natural Resources); Natural Resources Canada; Metals Economics Group.

In short, data on exploration and deposit appraisal expenditures, drilling and public financing all indicate a reversal of the downward trend in exploration observed between 1996 and 2000. The year 2002 was marked by a significant map-staking rush between the months of February and May when 46 735 claims were registered. Most of these claims were staked in the Otish Mountains and James Bay areas following the discovery of kimberlite intrusions, a number of which proved to be significantly diamondiferous. The impact of this rush was seen in the number of active claims in Québec, which rose from 101 200 at the end of 2001 to 150 000 at the end of September 2002. The surface area covered by these titles increased from 4.75 Mha to 7.1 Mha.

Highlights of Off-Mine-Site Exploration and Deposit Appraisal

Unquestionably, the most significant highlight of mineral exploration in Québec was the announcement in December 2001 of the discovery by Ashton Mining of Canada Inc. and SOQUEM INC. of two diamondiferous kimberlite pipes, Renard 1 and Renard 2, on the Foxtrot property, 80 km north of the Otish Mountains. On the heels of the initial announcement, a rush to register mining titles took place in the Near North of Québec, with 42 000 claims designated and registered covering a surface area of 2.2 Mha. In June, Ashton Mining and SOQUEM announced the recovery of 1.69 carats (ct) of diamonds in a 2.4-t sample from the Renard 2 pipe, for a diamond content of 0.69 ct/t. At the beginning of October 2002, eight diamond-bearing kimberlite bodies, Renard 1 to 8, had been discovered on the Foxtrot property. Four tonnes of bulk samples were collected from Renard 2, 3 and 4.

In June 2002, Pure Gold Minerals Inc. and Ditem Explorations Inc. confirmed the discovery of two new kimberlite pipes, H-1 and H-2, on the Beaver Lake project. The H-2 pipe proved to be diamond bearing. Several companies have also announced the presence of diamond-indicator minerals on their respective properties in this sector, including Majescor Resources Inc./Canabrava Diamond Corporation, Majescor Resources Inc./BHP Billiton Diamonds Inc., Melkior Resources Inc., and Exploration Dios Inc.

In August 2002, Majescor Resources Inc. announced that it had recovered two microdiamonds from an 8.5-t sample collected from a kimberlite sill discovered in the fall of 2001 in the Wemindji area of the James Bay region. In this same sector, Dianor Resources Inc. reported finding two microdiamonds in two of the ten xenolithic lamprophyre dykes that it had identified. Further to the south, in the James Bay Lowlands region, Poplar Resources Ltd. reported the discovery of kimberlite-indicator minerals at the Nottaway project. In the spring of 2002, TGW Corporation also announced the discovery of kimberlite-indicator minerals in a sector west of Matagami. In March 2002, Géologie Québec and the Geological Survey of Canada announced the discovery of chromium picroilmenites in esker sediments in the Lac Bienville area. In addition to previously identified diamondiferous dykes, Diamond Discoveries International Corp. found four kimberlite pipes in the Torngat Mountains region east of Ungava Bay in 2002.

Base- and precious-metals exploration continued to focus primarily on the Abitibi-Témiscamingue area and on northern Québec. Aurizon Mines Ltd. conducted a $2 million exploration program in 2002 to extend resources and increase the mining reserves of the former Casa Berardi West mine where a 1.5-million-ounce (oz) mineral resource has already been estimated. Recent drilling has indicated an extension of the Main zone to between 500 m and 1000 m below the surface, where an indicated mineral resource of 450 000 oz of gold had previously been estimated above the 300-m depth. A little further to the south, Cancor Mines Inc. announced in the summer of 2002 that drilling on the Gemini and Turgeon properties had produced a section yielding 9.46 g/t of gold over 6.0 m. International Taurus Resources Inc. and Fairstar Explorations Inc. began work to develop an open-pit mine at the Fenelon deposit located between Matagami and the Detour mine in Ontario. Maude Lake Exploration Ltd. announced a new 808 000-t estimate of inferred resources yielding 9.6 g/t for a total of 249 000 oz of gold at its Comptois project located near Lebel-sur-Quévillon.

On the Francoeur and Norex properties, Richmont Mines Inc. conducted a $1.3 million exploration program enabling it to confirm the continuity of the North zone at a depth of 830 m to 1075 m in the eastern sector. South Malartic Exploration Inc. announced a new estimate of measured, indicated and inferred resources of 7.1 Mt grading 2.3 g/t gold on its Croinor property. Virginia Gold Mines Inc., Noranda Inc. and Novicourt Inc. concluded strategic agreements to conduct airborne MegaTEM surveys of vast areas of the Abitibi region, to be followed by drilling of the anomalies identified. MegaTEM technology can detect polymetallic deposits at depths of up to 250 m.

In February, Virginia Gold Mines Inc. and TGW Corporation announced their findings on the Poste Lemoyne property in the Near North. Vertical drilling to a depth of 150 m returned 12.83 g/t gold over 11.65 m in the Orfée zone. Virginia Gold Mines Inc. and Cambior Inc. announced that they had intersected extensions to zones 30 and 32 on the La Grande South property. In 1999, the geological inventory of zone 32 was estimated at 4.2 Mt grading 2.1 g/t gold. Matamec Explorations Inc. reported an intersection grading 10.46 g/t gold over 10.8 m on its Sakami property.

In the Far North, Virginia Gold Mines Inc. and BHP Billiton announced an intersection yielding 9.03% nickel, 0.6% copper and 9.11 g/t platinum and palladium over 2.55 m in the Nancy zone on the Gayot property. Canadian Royalties Inc. intersected high grades in the Mesamax zone near a drill hole that had previous returned grades of 4.42 g/t platinum group elements (PGE), 0.91% nickel and 1.73% copper over 32.1 m.

Ressources Appalaches Inc. and Marum Resources Inc. reported drilling results on the B20 property in the North Shore region. Ten-metre-wide mineralized horizons were reported to be enriched to up to 1.2% nickel, 1.6% copper, 0.13% cobalt and 0.4 g/t platinum. Four drill holes intersected nine mineralized zones yielding up to 1.6% nickel, 1.5% copper, 0.18% cobalt and 0.2 g/t platinum.

In April 2002, McKenzie Bay International Ltd. revealed the results of a feasibility study recommending the development of a vanadium mine at the Lac Doré deposit, located southeast of Chibougamau, and the construction of a vanadium processing plant.

Mine-Site Exploration, Deposit Appraisal and Development Highlights

In January 2002, Richmont Mines Inc. began production at the Beaufor mine, near Val-d'Or, which had been closed for 18 months, and expects to renew reserves mined during the course of the year. Near Chibougamau, the Joe Mann gold and copper mine, owned by Campbell Resources Inc., resumed activities in March 2002. McWatters Mines Inc. ceased operations at the Kiena gold mine at the end of September 2002, but a $1.25 million exploration program has been undertaken to search for new mining reserves.

The Sigma-Lamaque Limited Partnership (60% McWatters Mines and 40% SOQUEM) began removal of the waste rock covering the deposit identified near the surface at a rate of approximately 40 000 tonnes per day (t/d). This work will provide access to more than 10 million tonnes (Mt) of ore grading approximately 2.6 g/t. The open-pit mine is expected to produce 856 000 oz of gold between 2003 and 2008. Production is scheduled to begin in December 2002 with a concentrator whose processing capacity will have been expanded from 3000 to 5000 t/d. This re-opening was made possible by the relocation of two portions of Highway 117, at a cost of $6.5 million, and through a loan guarantee from Investissement Québec in the amount of $17 million.

Campbell Resources Inc. also continued development at the Copper Rand 5000 gold and copper mine with the sinking of an internal 382-m shaft to a vertical depth of 1265 m. Operations are expected to resume in late 2003.

Agnico-Eagle Mines Ltd. also announced that its deep-drilling campaign at the LaRonde mine had encountered economic mineralization at the western limits of Zone 20 North. This suggests a greater-than-anticipated strike length and additional potential for the development of a new parallel gold zone. With the underground mine and mill operating at 7000 t/d since the beginning of October, the LaRonde mine expects to produce close to 285 000 oz of gold in 2002. Mineral resources in excess of 8.5 million oz of gold make it the largest gold mine in Canada and should ensure continued operation over the next 20 years.

Major exploration programs in 2001 enabled Cambior Inc. to renew its mining reserves at the Doyon, Mouska and Sleeping Giant mines and maintain a level comparable to that of the previous year.

Program to Acquire Geoscientific Knowledge

In fiscal year 2002-03, Géologie Québec will devote $8 million to its program of geoscientific inventories and studies. During the summer of 2002, six geological mapping projects – covering almost 45 000 km^2 – and twenty-three thematic studies were conducted in five regions of Québec.

The 2002-03 campaign marked the fifth year of *Projet Grand-Nord*, a project that involved the geological mapping of Québec north of the 55th parallel at a scale of 1:250 000. Three new geological maps were produced in the Umiujuaq, Lac-à-l'Eau-Claire and Puvirnituq sectors. These inventories are accompanied by a variety of studies on the diamond mineral indicators and the metallogeny and geochronology of the areas.

The projects under way in the James Bay region focus primarily on synthesizing surveys that have been conducted of the geology and metallogeny of the La Grande River since 1995. A new collection of coloured geological maps at a 1:50 000 scale will soon be delivered to clients.

The work carried out in the Abitibi region is part of the three-year action plan (2000-03) developed by the Ministère in collaboration with industry. Géologie Québec continued its inventory surveys in the Urban-Barry belt east of Lebel-sur-Quévillon, along with the metallogeny study of the Doyon-Bousquet-LaRonde mining camp begun in 2000. A 3D-modelling component was added to the study. A new mapping project was also undertaken in the Lake Olga sector, between Matagami and Chibougamau, along with a metallogeny study north of Rouyn-Noranda along the Porcupine-Destor fault.

Géologie Québec continued its 1:50 000-scale coverage of the Grenville Province, as well as its regional syntheses. One of these syntheses involves the Saguenay region, which is a sector that is particularly likely to contain nickel, copper and PGM mineralization. Another mapping project, which covers the territory north of Mont-Laurier, will make it possible to complete the synthesis of the northern part of the Central Metasedimentary belt.

Finally, over the past year, Géologie Québec initiated a new three-year work plan focussing on the Appalachians. Phase I of the work began with a project involving the compilation of previous work, updating geological information, and studying the metallogeny of the southern part of the Gaspé and the Lower St. Lawrence. These studies focus primarily on precious and base-metal mineralization in red-bed and Carlin-type environments, respectively.

Tax and Financial Measures in Support of Mineral Exploration

Tax Measures

Québec makes several tax incentives available that significantly reduce the net cost of exploration for mining companies in Québec and promote the financing of their activities (www.mrn.gouv.qc.ca/mines/fiscalite/index.jsp).

In 2001, the Québec government introduced a new tax measure: the refundable tax credit for resources. This tax credit is available to companies with eligible expenses in Québec after

March 29, 2001. The tax credit rate amounts to 40% of eligible expenses in the case of a non-producing company and to 20% in the case of a producing company. These rates increase to 45% and 25%, respectively, for exploration taking place in Québec's Near North and Far North regions.

On August 20, 2002, the Québec government announced a major improvement to the refundable tax credit for resouces. Until 2007, in the interest of encouraging new discoveries and renewing mining reserves, companies will be allowed to claim a tax credit of up to 60% of exploration expenditures in Québec. The improvement applies to eligible expenditures incurred for exploration work, up to the amount of Québec income tax and tax on capital payable by such corporations.

In addition, the credit on duties refundable for losses provided under the *Mining Duties Act* is equal to 12% of the lesser of the amount of annual loss or exploration, deposit appraisal and mine development expenses. The credit is increased to 15% if the exploration expenditures have been incurred in Québec's Near and Far North and the refundable tax credit for resources has not been claimed for the expenditures. The credit on duties refundable for losses is non-taxable and does not reduce the exploration expenses that a mining company can claim under the *Mining Duties Act* and the *Taxation Act*.

An additional 50% deduction of qualifying exploration expenses may be granted under the *Mining Duties Act*, up to a limit of 50% of the annual profit. Eligible expenses include surface exploration and underground core-drilling work where performed on land that is not under a mining lease or mining concession or where no extraction work has been carried out in the previous five fiscal years.

In fact, based on the set of tax measures described above, and the addition of a tax deduction representing 9.04% of exploration expenditures incurred, mining companies can receive assistance from Québec amounting to 87 cents for each dollar spent on exploration and deposit appraisal activities.

In addition, the flow-through share program, widely used by junior mining companies to finance their exploration expenditures, has been extended to December 31, 2003. Before that date, Québec investors will continue to obtain a tax deduction that can amount to as much as 175% of the amount invested if the shares are issued by a company that incurs surface exploration expenses in Québec. The flow-through share program in Québec remains the most generous in Canada with a net after-tax cost of $224 for each $1000 of flow-through shares purchased for taxation year 2002. This represents approximately half of the net cost seen in other mining jurisdictions in Canada.

The Québec government also offers mining companies the following attractive tax measures relating to mineral development and production: the additional allowance for a northern mine, the depreciation allowance, the processing allowance, the credit on duties for the cost of bringing an orebody into production, and measures applicable to research and development and to mine tailings.

Programs of Financial Assistance

During the 2002-03 fiscal year, the MRN allocated a total of $7.8 million to encourage mineral exploration activities in Québec under the *Programme d'assistance à l'exploration minière du Québec* (Québec Mineral Exploration Assistance Program) (PAEM). This program is targeted at prospectors, regional exploration funds, Aboriginal mining funds, and exploration companies (www.mrn.gouv.qc.ca/mines/soutien/soutien-exploration.jsp).

Independent prospectors can obtain up to $5000 in financial assistance for a basic prospecting project and up to $15 000 for an advanced project. In certain regions of Québec, assistance for prospectors is managed through regional exploration funds. The *Fonds de prospection minière jamésien* (James Bay Mineral Prospecting Fund) is a new fund created this year and brings the number of funds to six. Each of the six regional funds will receive the sum of $250 000. The MRN and the regional funds manage 186 prospecting projects totaling $1.9 million. With financial assistance in the amount of $0.65 million, the MRN has continued to support the Aboriginal mining funds with a view to encouraging Native communities in the Near and Far North to participate in the develop*ment of the mining potential of this vast territory. The new Cree Mineral Exploration Board will* now be added to the two existing Aboriginal funds, the *Fonds d'exploration minière du Nunavik* (Nunavik Mining Exploration Fund) and the *Fonds minier innu Nitassinan* (Nitassinan Innu Mining Fund).

Mining companies have also received $0.9 million in financial assistance for 21 exploration projects under component B of the PAEM. For 2002-03, only projects located in the Abitibi-Témiscamingue and Côte-Nord administrative regions were eligible for this assistance. Companies may receive financial assistance of up to 50% of the cost of their exploration work, up to a maximum of $50 000 per project and $75 000 for a project located in the Near North and Far North regions.

In order to promote renewal of mining reserves, the MRN has provided financial assistance totaling $4.3 million to enable companies to undertake deep drilling projects and advanced exploration work. This assistance may total a maximum of $50 000 for a deep drilling project and $1 million for a project involving advanced exploration.

Finally, a total of $1.2 million was granted to mining companies under the *Programme d'assistance financière aux infrastructures minières* (Financial Assistance Program for Mining Infrastructures) and the *Programme d'assistance financière à la réalisation d'études technico- économiques et à l'innovation technologique* (Financial Assistance Program for Technical and Economic Studies and Technological Innovation).

Venture Capital Funds

Several venture capital funds invest in companies involved in mineral exploration in Québec. Among them, the *Société d'investissement dans la diversification de l'exploration* (SIDEX) (www.sidex.ca) was established in the spring of 2001. The initial capital for SIDEX was set at $50 million over five years (until 2004-05) and provided by its two limited partners (70% from the Québec government and 30% from the Solidarity Fund QFL). The mission of this limited partnership is to invest in the capital stock of companies involved in mineral exploration in Québec in order to diversify Québec's mineral base in terms of the commodities extracted and in terms of mineral-producing regions.

SIDEX intends to limit to 10% its participation in the capital stock of companies in which it invests, except under exceptional circumstances. It can invest in companies headquartered outside Québec subject to the condition that the entire amount of its investment be directed toward Québec. Where SIDEX invests in a company, the latter is not prohibited from claiming the refundable tax credit (for exploration costs). As of September 16, 2002, total investments by SIDEX exceeded $8.8 million.

The mission of limited partnerships SODÉMEX (*Société de développement des entreprises minières et d'exploration*) and SODÉMEX II, created by Capital d'Amérique CDPQ and SOQUEM, is to participate in the development of the mining industry in Québec. This mission is accomplished through investments ranging from $100 000 to $500 000 in junior exploration companies and mining producers involved in Québec whose market capitalization is small (below $125 million), and in Québec exploration companies involved in exploration activities outside the province.

During 2001, the two limited partnerships took part in primary market financing via prospectus, private investment and the exercise of stock purchase warrants; this financing totaled $1.3 million and involved 15 companies. As of December 31, 2001, the market value of the mining portfolios of SODÉMEX and SODÉMEX II amounted to $27 million. It should be noted that the portfolio owned by the two limited partnerships consists of shares in 40 exploration companies and 8 mineral producers.

On December 21, 2001, the Caisse de dépôt et placement du Québec and its subsidiary, Capital d'Amérique CDPQ, privately transferred to a single management entity, SODÉMEX II, whose only general partner is Capital d'Amérique CDPQ, all their shares in the following companies: Richmont Mines Inc., Cambior Inc., McWatters Mines Inc., Lyon Lake Mines Ltd., Orleans Resources Inc. and Aurizon Mines Ltd. These transfers were carried out for administrative purposes in order to consolidate the mines and metals sub-sector shares of the SODÉMEX II investment fund, thereby facilitating decision-making and responding to the various needs of the companies.

The investment portfolio of these companies is managed by Gestion SODÉMEX, whose president is Denis Landry (dlandry@sodemex.com).

The Solidarity Fund QFL also owns a mining portfolio including exploration companies and mining producers (www.fondsftq.com), while the Nord-du-Québec QFL Regional Solidarity Fund and the Abitibi-Témiscamingue QFL Regional Solidarity Fund are also interested in the mineral exploration sector. The majority of investments are directed toward bringing new orebodies into production and to the growth of Québec mining producers, with the remainder being allocated primarily to working capital support for exploration companies.

As of December 31, 2001, more than two thirds of the $67.5 million envelope reserved for the mining sector had already been invested in or committed to companies active in Québec. This excludes the share of the Solidarity Fund in SIDEX. During 2001, the workers' fund and the regional funds invested over a million dollars in debentures and shares in the following exploration companies: Aurora Platinum Corp., Maude Lake Exploration Ltd., Dianor Resources Inc., Majescor Resources Inc., MSV Resources Inc., Sirios Resources Inc., and Dios Exploration Inc.

2.6 ONTARIO[5]

Ontario, Canada – The Future of Mining

Ontario's mining industry is strong, confident and poised. The province continues to build on its standing as one of the top jurisdiction for mining investment attractiveness. The industry's confidence in the future and its firm belief in Ontario's potential is testimony to the many exciting initiatives the provincial government has recently implemented – initiatives that have made Ontario one of the premier mining jurisdictions in the world.

Ontario's policies and initiatives in support of mining are strengthening the mines and minerals sector and are clearly communicating to the global exploration and mining industry that Ontario is open for business. In fact, expenditures on mineral exploration in the province over the past several years have continued to increase, the reverse of many of Ontario's provincial and international counterparts.

General Overview

Preliminary figures for 2001 indicate that the total value of Ontario's mineral production was $5.63 billion, down slightly from $5.87 billion in 2000. Lower nickel prices were primarily responsible for the decline in the value of metals while nonmetals were up slightly in 2001. The contribution of the three commodity groups included: metals, $3.4 billion; nonmetals, $2.1 billion; and fuels, $130 million (structural materials are now included with nonmetals). Ontario was responsible for about one third of Canada's metallic minerals production value and for 28% of the *nonmetals production value*.

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[5] The Ontario review of activities was prepared by Peter Cashin. For more information, the reader is invited to contact Mr. Cashin by telephone at (705) 670-5620 or by e-mail at peter.cashin@ndm.gov.on.ca.

Ontario maintained its status as the lead jurisdiction in Canada in terms of value of non-fuel mineral production. It accounted for 29% of Canada's non-fuel mineral production value in 2001, compared with 31% in 2000. Ontario had a margin of more than $2 billion over the closest jurisdiction.

The five highest-value metallic minerals produced in Ontario in 2001 were nickel ($1.118 billion), gold ($1.052 billion), platinum group metals ($514 million), copper ($450 million) and zinc ($104 million).

In 2001, the top two commodities produced in Canada were gold and nickel and Ontario provided 63% of Canada's nickel production and 50% of its gold production.

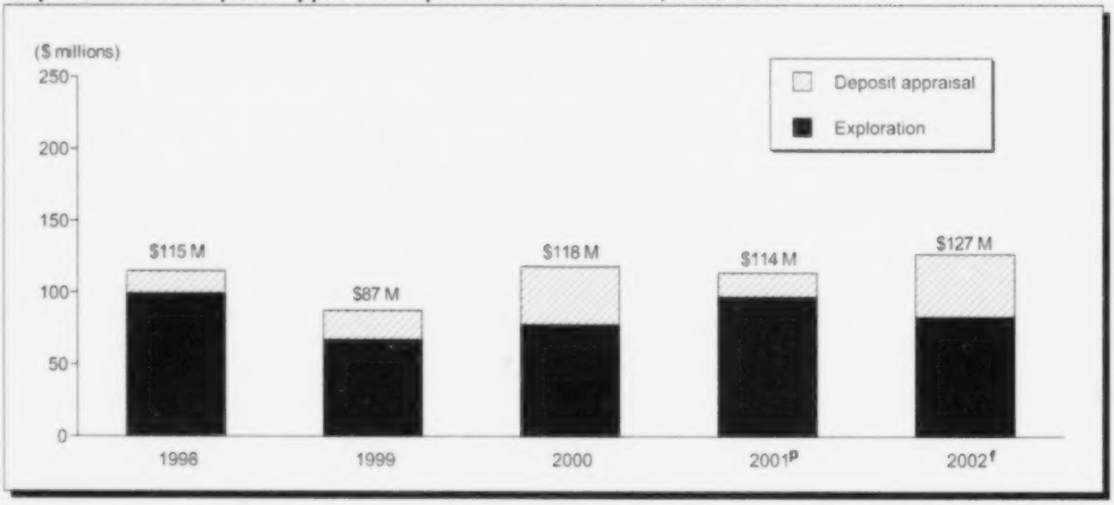
Final exploration and deposit appraisal expenditures for 2000 totaled $117.9 million (**Figure 21**). In contrast to the national trend, preliminary estimates for 2001 decreased slightly to $113.6 million and are expected to increase to $126.7 million in 2002.

Spending intentions for 2002 indicate that Ontario will lead all Canadian provinces and territories in exploration and deposit appraisal expenditures for the third consecutive year with 25% of Canada's total expenditures.

Preliminary figures for 2001 indicate that $308.6 million was spent on mineral exploration, deposit appraisal and mine development expenditures in Ontario. This total consists of $74 million (24%) for exploration and $39 million (13%) for deposit appraisal, and mine development expenditures are estimated at $195 million (63%). Forecasts for 2002 estimate that total expenditures will decline to $301 million. The decline is attributable to reduced spending on mine development, which is on a downward trend that began in 1998.

In 2001, spending by Ontario's junior mining companies increased by more than 45% to $40 million while spending by Ontario's senior mining companies decreased by more than 15% from 2000 to

Figure 21
Exploration and Deposit Appraisal Expenditures in Ontario, 1998-2002



Sources: Ontario Ministry of Northern Development and Mines; Natural Resources Canada.
f Forecast; P Preliminary.

$74 million. Forecasts for 2002 indicate that spending by Ontario's junior companies will increase by more than 5% from 2001 to $42.3 million and that spending by Ontario's senior companies will increase by 14% to $84.4 million. Ontario's senior companies account for about two thirds of Ontario exploration expenditures, a decline from over 75% in 1999 and 2000.

The number of mining claims in good standing in Ontario at the end of 2001 was 184 433, an increase of 13.6% from 2000. The increase can be attributed to the ongoing interest in gold and to continued interest in exploring for diamonds and platinum/palladium.

Exploration Turnaround in Ontario

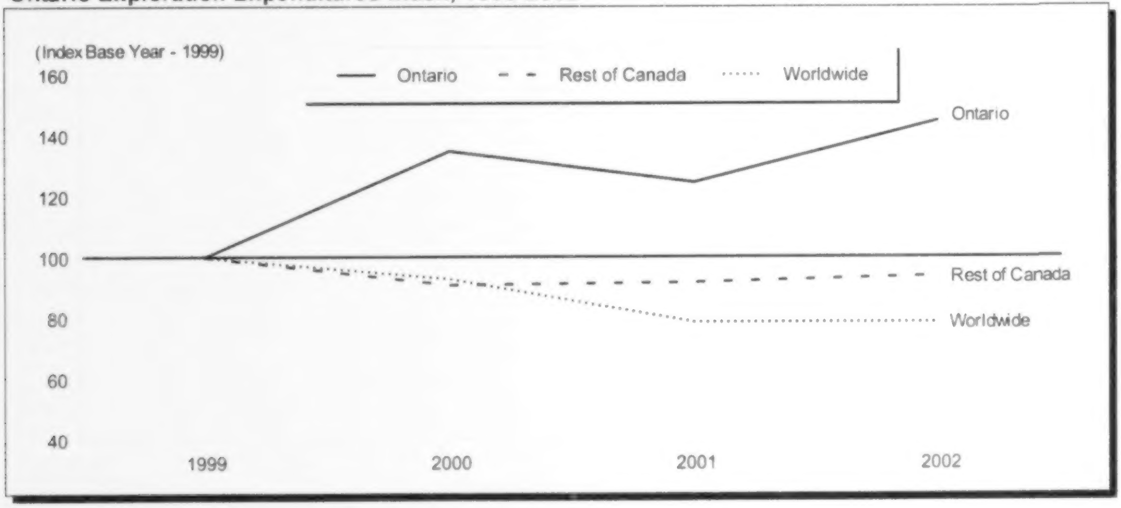
How has Ontario managed to increase exploration activity when investment in many sectors of the economy is declining?

Let's look at what has happened recently!

Exploration and deposit appraisal expenditures in Ontario have increased significantly over the last few years in contrast to substantial downward trends at the national and international levels (**Figure 22**). More specifically, Ontario expenditures climbed 35% between 1999 and 2000 to $118 million when most jurisdictions were experiencing dramatic decreases in exploration activity. Ontario had a slight decline to $114 million in 2001 but another significant increase to $127 million is forecast for 2002.

Worldwide exploration expenditures reached their lowest levels in nine years during 2001, falling to $2.2 billion after climbing to $5.2 billion in 1997. Between 1997 and 2000, Latin America, Australia, Africa, Pacific-Southeast Asia and the United States saw their expenditures slashed by more than half while Ontario was already on the upswing.

Figure 22
Ontario Exploration Expenditures Index, 1999-2002



Source: Ontario Ministry of Northern Development and Mines.
Notes: In order to compare expenditures from Ontario, the rest of Canada and the world, the data have been indexed using 1999 as the base year. The data points for each year represent the percentage increase since 1999. For Ontario and Canada, 2001 data are preliminary and 2002 data are based on company spending intentions as compiled in January 2002.

How did Ontario do it?

Canadian-based mining companies are responsible for more than 30% of exploration programs around the world and, in 2000, Canada was the leading recipient of funding from these companies. Many Canadian exploration companies redirected their activity outside of the country during the ascent of exploration in undeveloped countries in the mid-1990s. The flight of exploration activity outside Canada was a learning experience for government and the industry. The lesson for government was that Canadian jurisdictions would have to compete internationally since many foreign governments were trying to attract Canadian expertise and investment dollars in mineral exploration. Investors were not going to explore in Canada just because it was their base of activities. The lesson for mining companies operating overseas was that political instability can override good geology. This was evidenced by potential deposits left undeveloped in places such as Russia and Africa as security of title could not be obtained.

The Ontario government recognized the importance of the mineral sector to future prosperity and brought in key policy and program initiatives favourable to growth. These initiatives included:

- decreasing taxes for mining and exploration companies;
- increasing the amount of geological information;
- investing in research; and
- improving access to mining-related information in Ontario.

Results!

The Ontario government sent a positive message to the industry by introducing these initiatives combined with favourable programs and policies. In addition, great geological potential and vast unexplored regions of Northern Ontario helped restore exploration activity in the province. The success of these initiatives can be measured by:

1. Ontario being among the top jurisdictions in the world for mineral investment attractiveness, according to the Fraser Institute;

2. The continued increase in exploration expenditures; and

3. The feedback from industry stakeholders indicating that Ontario is encouraging exploration and development, making it a great place to explore.

Spotlight on Ontario Government Investment in Exploration R&D

In September 2000, the Ontario government assumed a leadership role in challenging the exploration community's technological "status quo" by investing in new and innovative exploration technologies and methods. The intent of this investment is to enhance the efficiency of exploration programs in high-potential geological areas, particularly in areas of thick glacial deposit and Paleozoic rock cover.

The Ontario Mineral Exploration Technologies (OMET) program is a four-year, $8 million initiative to develop and test innovative mineral exploration technologies and methods. By encouraging homegrown solutions to the province's mineral exploration challenges, the initiative will reaffirm the Ontario's government's commitment to the mining industry and consolidate the province's position as one of the world's premier mining jurisdictions. As these new technologies and methods prove effective, they can be exported around the world and enhance the role of Ontario-oriented firms on the global stages.

Goal and Objective

OMET's objective is to develop new technologies and methods that will help find the next generation of Ontario's mineral deposits in areas of complex geology.

The Ontario government expects the OMET program to lever its research investment in innovative, collaborative, multi-disciplinary technology and methods and to provide solutions to technical problems facing the mineral exploration industry in Ontario.

Priority Areas for Research

Three priority areas of research envisioned for the OMET program are:

1. Best techniques to find mineral resources in bedrock beneath conductive or thick overburden/bedrock, which are common conditions throughout Ontario;

2. Best methods to *see* through the Paleozoic rocks to explore for mineral resources, including diamonds, in the underlying Precambrian rocks of the Hudson Bay and James Bay lowlands; and

3. Effective ways to utilize Ontario's Quaternary geology to identify new mineral deposit targets in bedrock.

Three types of projects that will be considered are:

1. *Develop a concept* project: The concept is at the theoretical/idea stage, or the concept requires validation under Ontario's complex geological conditions;

2. *Prove a concept* project: The technology is proven to work at the desktop level or in the lab, or a method or instrumentation will be derived to work under specific Ontario field conditions; and

3. *Demonstration* project: The technology is proven in the field or by another industry, and the research will show that the technique is applicable to Ontario's mineral exploration industry.

Cumulative conditional awards from OMET to date equal $5 million. The researcher combined cash and in-kind contributions for all the projects amount to $8.3 million. All sources of cash and in-kind contributions have resulted in $13.2 million in research into new mineral exploration technologies in Ontario.

Exploration Highlights - Northeastern Ontario

Timmins District

De Beers Canada Exploration Inc. continues to explore and conduct advanced exploration on and around the Victor diamond project, 90 km west of the community of Attawapiskat. The company will conduct a winter exploration program again this year and carry out other work in support of a feasibility study. The Victor pipe has an inferred diamond resource of 36.2 Mt with a preliminary revenue value of $92/t.

In July 2002, Placer Dome Inc. and Kinross Gold Corporation merged their Timmins property assets as the Porcupine joint venture. The joint venture announced a $5.26 million diamond-drilling program on the Hoyle Pond and Dome mine properties, on the Pamour, Hallnor-Bonetal-Broulan area, and on the Owl Creek, McIntyre and Buffalo Ankerite properties in Timmins. At the beginning of

2002, the Porcupine joint venture had a 2.3 million-oz gold reserve and an additional 5.2 million-oz gold resource.

Pele Mountain Resources Inc. has discovered and sampled more than 20 new diamondiferous volcanic units in the southwestern corner of the Festival property north of Wawa. The newly discovered Genesis diamond occurrence has returned 53 commercial-sized diamonds from a bulk sample of 4.5 t.

Kennecott Canada Exploration Inc. has completed a summer program of prospecting, mapping, stripping, channel sampling and soil sampling on the Band-Ore GQ property north of Wawa. A total of eight new areas of heterolithic breccia units, geologically similar to the Engagement zone, have been explored and sampled this year. Over 20 000 diamonds, including 373 macrodiamonds, have been recovered from caustic fusion processing of bulk samples from the Engagement zone.

A 6-hole diamond drill program and outcrop sampling on the Enigma property by Oasis Diamond Exploration, operator of the Enigma joint venture with Iciena Ventures and Arctic Star Diamond Corp., has led to the discovery of two new diamond occurrences north of Wawa. Diamond drilling and outcrop sampling have yielded a total of 233 diamonds from an 858-kg sample. A second site, located 7 km from the original showing, yielded 20 microdiamonds and 1 macrodiamond from a 36.06-kg sample.

Kirkland Lake District

Kirkland Lake Gold Inc. is testing narrow, near-surface, high-grade, gold-bearing quartz veins and the "Mud Break" on the Kirkland Lake "Main Break." Dewatering at the Macassa mine No. 3 shaft is progressing and diamond drilling has commenced on the 3835-ft level.

Queenston Mining Inc. intersected a new gold zone in two diamond drill holes in Gauthier Township, referred to as the Anoki South zone. Hole AN02-20 intersected 4.48 m grading 6.70 g/t gold and hole AN02-21 intersected 3.02 m grading 18.92 g/t gold.

Acrex Ventures Ltd. completed six diamond drill holes on its Michaud gold property in Michaud Township. Four holes tested the Southwest zone (inferred resource of 2.4 Mt averaging 6.07 g/t gold) and one hole each tested the "04" extension zone and the "55" zone, both west of the Southwest zone.

Tom Exploration Inc. optioned the Lalonde property consisting of 114 unpatented mining claims in Munro Township. There are 10 areas with documented gold mineralization. The company completed overburden stripping, sampling and detailed ground geophysics over selected areas. Several grab samples returned values up to 29.31 g/t gold.

Cabo Mining Corp. has recovered a total of 95 diamonds, including 4 macrodiamonds, from a 9.3-kg sample of diamond drill core from its Cobalt area property. The diamond-bearing sample was taken from a 4.15-m interval within a 61.0-m intersection of a lamprophyric dyke within a mafic breccia zone. This zone is open in all directions.

Goldeye Explorations Limited completed overburden stripping and channel sampling on the Lacarte property in Tyrell Township. The property covers 5 km of the Tyrrell shear zone, the host of the Lacarte (600 000 tons grading 6 g/t gold) and Big Dome (best assay of 144 g/t gold over 1.4 m) gold zones.

Temex Resources Corp. completed a diamond drill program at the Juby deposit in Tyrrell Township. The deposit contains drill-indicated resources of 34 Mt grading 1 g/t gold (or 2.2 Mt grading 4.65 g/t gold). Temex's diamond drill hole JU-02-01 intersected an interval of 14.22 m grading 5.04 g/t gold, including 3.95 m grading 8.85 g/t gold.

Sault Ste. Marie District

Amerigo Resources has entered into a joint venture with Falconbridge Limited on the Island Copper property in Aweres Township. Work completed by Falconbridge Limited on the property included airborne geophysics, Induced Polarization surveys, a residual gravity survey, geological mapping, and geochemical sampling. Past diamond drilling on the property returned a 9.5-m intersection grading 4.02% copper and 1.03 g/t gold.

Sudbury District

FNX Mining Company Incorporated, in a joint venture with Dynatec Corporation, is exploring Inco's Victoria, McCreedy West, Levack, Norman, and Kirkwood properties. Diamond drilling is under way at most properties and underground reconstruction commenced at the McCreedy West portal. Excellent diamond drilling results have been reported at Victoria (42.3 feet grading 6.7% copper, 1.3% nickel and 13.3 g/t total precious metals [TPM] in the Powerline deposit), Norman 2000 (257.5 feet grading 3.4% copper, 0.3% nickel and 4.2 g/t TPM), McCreedy West (14.5 feet grading 13.93% copper, 2.2% nickel and 15.9 g/t TPM at 700 Vein), McCreedy West Inter Main zone (21.1 feet grading 0.6% copper and 3.0% nickel), McCreedy West PM zone (64.1 feet grading 15.2 g/t TPM), Levack No. 7 (24.0 feet grading 1.01% copper and 2.68% nickel), and Kirkwood (29.0 feet grading 2.31% copper, 1.28% nickel and 3.0 g/t TPM).

On July 23, 2002, Falconbridge Limited reported a preliminary inferred mineral resource at the Nickel Rim South property of 2.9 Mt in the footwall to the Sudbury Igneous Complex grading 2.4% nickel, 6.6% copper, 4.5 g/t platinum, 5.4 g/t palladium, 3.6 g/t gold and 25.0 g/t silver. Diamond drilling on this target continues.

Aurora Platinum Corporation is active in its option joint-venture agreement with Falconbridge Limited to explore for magmatic sulphide deposits. Diamond drilling and airborne and ground geophysical surveys were conducted on the South Range of the Sudbury Igneous Complex between the Garson mine and Norduna mine. This area also includes the past-producing East and Falconbridge mines.

Ursa Major Mineral Limited conducted extensive diamond drilling at the former Falconbridge Limited Sudbury-Shakespeare deposit (Nipissing diabase). Favourable copper-nickel-platinum group metals (PGM) results were encountered in strongly disseminated nickel-copper sulphide mineralization. Drill intercepts of up to 89.3 m grading 0.57% nickel, 0.64% copper, 0.56 g/t platinum, 0.61 g/t palladium and 0.04% cobalt were returned from recently completed diamond drilling.

Pacific North West Capital Corporation explored its holdings by ground extensive diamond drilling and detailed geophysical surveys in the River Valley, Agnew Lake, and East Bull Lake differentiated mafic intrusive rocks. Partners include Anglo American Platinum Corporation Limited, Platinum Group Metals Corporation and Lonmin Plc. Total measured and indicated resources on the property are 825 900 oz of palladium, platinum and gold. In addition, there are inferred resources of 200 600 oz of palladium, platinum and gold, for a total of 1 026 500 oz.

Mustang Minerals Corporation and partner Impala Platinum Holdings Limited also conducted extensive diamond drilling campaigns at the East Bull Lake and River Valley differentiated mafic intrusive complexes. Channel sampling at East Bull returned best assays of 1.92 g/t platinum-palladium-gold over 15.7 m, including 2.33 g/t platinum-palladium-gold over 7.0 m. Diamond drilling at River Valley returned up to 1.08 g/t platinum and 2.61 g/t palladium over 2.0 m.

Exploration Highlights - Northwestern Ontario

Red Lake and Kenora Districts

The Goldcorp Inc. Red Lake mine enjoyed continued success in outlining high-grade reserves and exploring other areas of high potential. Approximately US$12 million was spent in 2002 to explore the immediate mine property. The company is also spending approximately US$4 million on surface drilling of significant targets on adjacent properties.

Placer Dome's Campbell mine continued underground exploration this year and has successfully delineated new reserves and resources in the DC zone. Placer Dome is also drill-testing a new gold discovery on its Madsen option from Claude Resources, which has a very similar style of mineralization to the main Campbell-Red Lake gold deposit.

Rubicon Minerals Corporation acquired the McFinley mine property, which saw underground development work in the 1980s. A preliminary 3000-m diamond drill program is planned to test multiple mineralized zones in altered and deformed mafic rocks. Significant winter diamond drilling will also take place on other Rubicon and Rubicon-AngloGold (Canada) Exploration's joint-venture properties in the Red Lake belt.

Planet Exploration will continue drill-testing its Sidace Lake property in the Red Lake belt. A recently completed 12-hole (2200 m) program intersected significant mineralization (97.03 g/t gold over 0.20 m) hosted in quartz-sericite schist with appreciable stibnite.

Tribute Minerals Inc. completed a 4-hole (2000 m) drill program on its Dixie base-metal property in the Confederation Lake area. Previously completed TITAN-24 surveys were instrumental in targeting the drilling, which intersected 12.2% zinc over 1.0 m. Down-hole geophysics is expected to vector future drilling efforts.

King's Bay Gold and Solitaire Minerals drilled a small portion of a 700-m-long zone of intrusion-hosted sulphide mineralization on their Garnet Lake property located in the Confederation Lake area. Values as high as 2.83% copper and 1.30 g/t gold over 0.60 m have been intersected.

Wolfden Resources Inc. and First Au Strategies completed a 2000-m drill program on their Casummit Lake property, site of the past-producing Argosy gold mine, in the Birch-Casummit lakes area.

Champion Bear Resources Ltd. undertook a 4-hole diamond drilling program on the Marko's North pegmatite. Tantalum mineralization was confirmed along a 300-m strike length.

Southern Rio Resources Ltd. completed an 8-hole drill program on the Minnitaki Lake property. Visible gold was noted in late quartz and/or carbonate veins cutting strongly silicified and pyritized porphyry. The property is the subject of a joint-venture agreement with Wheaton River Minerals.

Thunder Bay District

PGM Ventures Corporation has initiated an exploration and evaluation program on the Thierry mine property at Pickle Lake. A $1.8 million program involving drilling, geophysics, surface trenching and metallurgical studies will be conducted to evaluate the PGM-nickel content at this historic copper producer. Diamond drilling on the property returned up to 3.1 m grading 3.42% copper, 0.63% nickel, 2.6 g/t platinum and 4.78 g/t palladium, and 6.1 m grading 2.64% copper, 0.62% nickel, 1.64 g/t platinum and 3.21 g/t palladium.

East West Resource Corporation Ltd. continued diamond drilling on the down-plunge extension of the Norton Lake copper-nickel-platinum group elements (PGE) prospect. A 15-m-wide pyrrhotite-pentlandite (po-pn) brecciated sulphide zone separated from a lower chalcopyrite-pyrrhotite-pyrite (cpy-po-py) zone by a 1-m gabbro-pyroxenite layer was intersected. Mineralization has been extended 500 m west with geophysics and to a depth of 225 m by diamond drilling.

The Lac des Iles mine of North American Palladium Ltd. produced in excess of 167 000 oz of palladium in the first three quarters of 2002, while continuing exploration in the mine area. Work included 47 000 m of diamond drilling on the Main high-grade zone as well as underground scoping and pre-feasibility studies.

Platinum Group Metals Limited has recently published results from diamond drilling on the Stinger zone on its Lac des Iles River property. Initial drilling indicated 4.92 g/t gold-platinum-palladium over 3.1 m within a layered series of pyroxenite and hornblende leucogabbro. The results included a 19-m section grading 1.06 g/t gold-platinum-palladium.

Houston Lake Mining Inc. and Agnico-Eagle Mines Ltd. completed a $500 000 exploration program on the Tib Lake intrusion. Exploration included mechanical stripping, prospecting and sampling, humus geochemical sampling, geological mapping, channel sampling and diamond drilling. Previous drilling on the property returned 18.47 m of 1.68 g/t PGE (palladium, platinum and gold), including 7.47 m of 2.76 g/t TPM (platinum-palladium-gold).

The Smoke Lake project, northeast of Marathon, is being explored by Freewest Resources Canada Inc., JonPol Explorations Ltd. and Saxony Exploration Ltd. Results include the discovery of mineralized boulders (returning up to 312.9 g/t gold) and several bedrock showings, including the Lucky 13, MZ, J&J and UGM, with grab sample assays ranging to 22.16 g/t gold.

Linear Resources Inc. received the final rare earth element assay results from its summer diamond drilling program at the Seymour Lake tantalum property located east-northeast of Armstrong. Recent diamond drilling on the North Aubry zone in 2002 returned up to 7.55 m grading 0.054% Ta_2O_5 and 17.7 m of 0.046% Ta_2O_5.

Exploration Highlights - Southern Ontario

In August 2002, Fortune Minerals Limited/Formosa Environmental Aggregates Ltd. updated the status of their Formosa Greenock high-calcium chemical limestone quarry project. Formosa intends to develop the property to mine a 15-Mt resource grading 99% calcium carbonate.

ONTZINC Corporation has acquired mineral leases on 3700 ha to explore for Mississippi Valley-type zinc targets. The company has budgeted for the drilling of 100 holes to provide initial testing of 24 anomalies that have been outlined in the project area. The estimated cost of the program as defined is $3.5 million.

In 2002, Derek McBride Management and Geological Services Inc. assembled a land position covering the Limerick Township "Macassa" nickel-copper deposit. A new resource calculation of the north zone suggests a drill-indicated resource of 3 700 000 t grading 0.57% nickel and 0.17% copper to a depth of 300 m. A second zone has an indicated resource of 4 600 000 t grading 0.17% nickel and 0.07% copper to a depth of 75 m.

In November 2002, Lydia Diamond Exploration of Canada Ltd. announced the results of independent sampling of a micaceous dyke on the company's Wolf Lake property in Tudor Township. Seven diamonds were discovered when the 27.65-kg sample was subjected to caustic fusion analysis. The largest stone is 0.63 mm x 0.46 mm x 0.32 mm.

2.7 MANITOBA[6]

Overview

Exploration and deposit appraisal expenditures in Manitoba remained firm in 2002 and are expected to be comparable or slightly higher than the $28.3 million spent in 2001. Company spending intentions for 2002 are estimated at $30.2 million; however, overall investment in mineral exploration in Canada in 2002 continued to be pressured by global economic and political uncertainties that have suppressed consumer demand for mineral commodities, especially base metals.

In June 2002, Hudson Bay Mining and Smelting Co., Limited (HBMS) permanently closed the Ruttan mine near Leaf Rapids. The zinc-copper producer was originally scheduled to close in 2003. The company cited generally depressed mineral markets and record low commodity prices as the main reasons for the accelerated closure. The Ruttan operation opened in 1974 and has supplied 30 000 t/y of zinc-copper concentrates to the Flin Flon smelter complex.

Although challenges have yet to be overcome before base-metal prices break out of their prolonged slump, there are reasons for optimism on the Manitoba exploration front. The resurgence and stabilization of the price of gold above $300/oz has spurred interest in a recent gold discovery and rekindled interest in previously discovered, undeveloped gold deposits throughout the province. As well, encouraging results from multimedia geochemical surveys conducted by the Manitoba Geological Survey continue to stimulate exploration activity in northeastern Manitoba.

The total area of mining claims, exploration permits and special exploration permits issued in 2001 was 2 052 604 ha, an increase from 1 832 577 ha in 2000 and 801 550 ha in 1999. The total area of mineral dispositions and leases in good standing at the end of 2001 was 3 667 145 ha, compared to 2 757 482 ha at the end of 2000. Surface exploration diamond drilling in 2001 was 78 925 m, down from 89 836 m in 2000.

Ongoing progress on major development projects also bodes well for the industry in Manitoba. Topping the list is the $400 million expenditure by HBMS on the 777 group of projects. The 777 projects include development of the 777 deposit, a 14.2-Mt orebody grading 2.53% copper and 5.09% zinc. The company estimates that an additional $600 million will be invested in capital expenditures throughout the Flin Flon-Snow Lake Belt over the life of the operational business plan to 2016.

The Government of Manitoba reconfirmed its commitment to mineral exploration and development in 2002 with the introduction of the Manitoba Mineral Exploration Tax Credit and the renewal of two mineral exploration assistance programs, the Mineral Exploration Assistance Program and the Manitoba Prospectors Assistance Program, for an additional three years.

Manitoba is recognized as a national leader in developing processes that effectively address environmental protection and resource development. Manitoba's Protected Areas Initiative (PAI) involves sectoral consultations to ensure that resource industries, as well as communities and First Nations, are fully consulted on proposals for the establishment of protected areas. This consultation process is unique in Canada and provides the industry with confidence that areas of high mineral potential will be identified and avoided for the purposes of protection under PAI. In 2002, Manitoba received the National Claim Tag Award from the Prospectors and Developers Association of Canada in recognition of the province's success in developing a technically advanced, methodical and transparent system of multi-stakeholder partnership in creating protected areas.

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[6] The Manitoba review of activities was prepared by D. Prouse, R. Syme, J. Payne, G. Ostry, and M. Lavergne of Manitoba Industry, Trade and Mines. For more information, the reader is invited to contact Ric Syme by telephone at (204) 945-6556 or by e-mail at rsyme@gov.mb.ca.

Partnerships between the mineral industry and northern and Aboriginal communities are critical in terms of certainty of land access and tenure for mineral exploration and development. The Manitoba Minerals Guideline is an initiative dedicated to building relationships and creating opportunities among Aboriginal groups, the mining industry and the Manitoba government. The Guideline, developed in 2000, seeks to establish a balance among the needs of industry, communities and the environment, and continues to provide a framework for discussion on future mineral development in Manitoba.

In 2002, the Government of Manitoba commissioned a Mining Task Force to seek public input on ways to strengthen the exploration and mining industry in the province and to promote sustainability. The Task Force consultations resulted in very specific messages from industry, communities and the public that focussed on:

- the need to remain competitive;
- the need to support mining communities faced with mine closures;
- concerns regarding land access and tenure and their impact on future exploration and mining development; and
- the importance of exploration incentives and geological survey programs.

Issues affecting the sustainability of the exploration and mining industry were also discussed at the 2002 Energy and Mines Ministers' Conference held in Winnipeg in September. The importance of remaining competitive internationally was presented as one of the major issues facing the industry in Canada. The Government of Manitoba called for an international study to look at Canada's overall competitiveness with respect to the mining sector to identify where efforts must be maximized to sustain the industry.

The Manitoba Geological Survey conducts geoscience investigations throughout the province in order to support and facilitate mineral exploration and contribute to better land-use planning. In 2002, a number of major collaborative geoscience projects were either completed or in their final stages (Thompson Nickel Belt compilation, Western Superior and Winnipeg Region NATMAPs, Flin Flon and Lynn Lake-Leaf Rapids Targeted Geoscience Initiatives, and Red River Paleoflood Project). Partnerships are an increasingly important component of geoscience program delivery in Manitoba. In 2002, more than $1.3 million in funding through partnership programs with the federal government, industry, universities, and other provincial departments contributed significantly to geoscientific studies in the province. At the same time, important enhancements to service delivery have been made:

- Twenty-three new services were added to the Internet Map Server (21 Bedrock Geology Compilation Map Series 1:250 000 maps, NATMAP Shield Margin 1:100 000 compilation of the Flin Flon belt, Southeast Manitoba Geoscience 1:250 000 compilation);
- Two point-data sets were added to the Internet Map Server (geochronology, mineral occurrences);
- Four major new searchable databases were added to the departmental web site (Bibliography of Manitoba Geology, Mineral Resources Library Catalogue, Mineral Inventory Records; News clippings);
- Two new Bedrock Geology Compilation Map Series 1:250 000 maps were published (NTS 64P and 63G); and
- Recent releases of reports and maps were made available for free download from the deparmental web site.

Manitoba recognizes that public awareness of the exploration and mining sector is also key to sustaining the industry. Several initiatives were undertaken in 2001/02 to promote the value of the industry and raise awareness of its commitment to environmental performance and social dialogue. Hands-on activities presented at events such as Provincial Mining Week and the Manitoba Mining and Minerals Convention, and a bursary program for geoscience students, helped support the advancement of the industry in the province.

Base Metals

Flin Flon-Snow Lake Region

HBMS continued to advance the 777 project in Flin Flon, the largest single capital investment in the company's history. The project comprises six components. Some of the sub-projects already completed include: expansion of the zinc pressure leach plant and construction of a new zinc cellhouse (2001); environmental upgrades to the copper smelter (2000); and the opening of the new Chisel North mine in Snow Lake (2000). Sinking of the 1530-m shaft at the new 777 mine in Flin Flon was completed in July 2002. Lateral development to access the two main ore zones will take place in 2003 and full production of 1 Mt/y is expected by the summer of 2004. The 777 deposit contains mineable reserves/resources of 14.2 Mt grading 5.09% zinc, 2.53% copper, 2.14 g/t gold and 31.51 g/t silver.

Hudson Bay Exploration and Development Co., Limited continued ground follow-up work, testing Spectrem airborne targets in the Flin Flon-Snow Lake belt and beneath the Paleozoic in the Hargrave Lake-Moose Lake area.

Thompson Nickel Belt and Extension

In Thompson, Inco Limited is expected to complete the construction phase of the Birchtree deepening project by the end of 2002. At that time, ore production will be possible from deeper levels of the mine. By late 2003, Birchtree is expected to reach full daily production of 3175 t, nearly double the capacity prior to the deepening. The project will access proven reserves of 13.6 Mt grading 1.79% nickel.

Inco Exploration and Technical Services completed an extensive program of geophysical surveys and drilling on high-priority targets in the Thompson Nickel belt to discover new mineralization near current mines or previously known deposits.

Northeastern Region

Donner Minerals Ltd. and Falconbridge Limited reached an agreement to explore Falconbridge's Stephens Lake property near Gillam. The property covers what Falconbridge interprets as the extension of the Thompson Nickel belt. The partners completed a large GEOTEM airborne survey.

Lynn Lake-Leaf Rapids Region

Aur Resources Inc. conducted drilling at its Counsell Lake property near Lynn Lake following up on a copper zone discovered in 2001.

Teck Cominco Limited completed a 5-hole drill program in late summer on its permits in the Baldock Lake area north of Thompson.

Platinum Group Metals

Gossan Resources Ltd. conducted a 4-hole drill program on the Peterson Block of its Bird River property in the fall. The company was testing VLF and magnetic anomalies outlined earlier in the year for platinum group elements (PGE) and base-metal mineralization. Previous prospecting and relogging of drill core from areas adjacent to the Peterson Block encountered encouraging base-metal and platinum-palladium values.

Gold

The resurgence in the price of gold in 2002 spurred interest in a recent gold discovery and has renewed interest in previously discovered gold deposits in Manitoba.

International Curator Resources Ltd. and Rare Earth Metals Corp. conducted follow-up drilling at their Assean Lake gold discovery northwest of Thompson. In 2001, drilling intersected the Hunt zone that has since been defined over a 700-m strike length and to a depth of 150 m in 24 holes. The Hunt zone has returned grades of up to 8.19 g/t gold over 7.1 m. Drilling of geophysical and mobile metal ion anomalies intersected new gold zones (including an auriferous banded sulphide iron formation) and encouraging nickel mineralization on the eastern portion of the large property.

In early 2002, Bema Gold Corporation optioned the Monument Bay gold property near the Ontario border from Wolfden Resources Inc. Bema completed a successful winter drill program, further defining the high-grade Twin B zone and upgrading the initial inferred resource to 500 600 t grading 18.3 g/t gold. This represents a resource of approximately 300 000 oz. A summer mapping and sampling program over the 25-km-long property was followed by a 2500-m fall drill program to examine the continuity of mineralization at two other high-grade zones on the property. Bema has announced that a 10 000-m drill program will be conducted in the winter of 2003 to upgrade the resource base of the Monument Bay property and to test exploration targets on their permits.

TVX Newmont Americas and partner High River Gold Mines Ltd. completed linecutting and were to commence drilling in November on the No. 3 zone northwest of the New Britannia mine at Snow Lake. The No. 3 zone provided approximately 250 000 t of feed for the Snow Lake operation in 1994-95 when the New Britannia mine was being dewatered and developed. Previous drilling at the zone had intersected encouraging gold grades below the 450-m level. The partners are considering using ore from the No. 3 zone to offset anticipated production shortfalls from the two main zones at the New Britannia mine.

First Majestic Resource Corp. completed a biogeochemical survey and geological mapping at its Wekusko-Ferro gold properties. Results from the biogeochemical survey will be used in conjunction with geology and geophysics to identify potential drill targets for a proposed winter drill program.

Wildcat Exploration Ltd. completed a 5000-m drill program on its extensive holdings in the Bissett camp in southeastern Manitoba. Drilling focused on the past-producing Poundmaker property where previous drilling intersected 2.84 m grading 9.0 g/t gold.

San Gold Resources Corporation also conducted drilling in the Bissett area at its San Norm property and Dave Bush completed a reverse-circulation drill program on claims north of Bissett.

Diamonds

Both junior and senior diamond explorers continued to acquire prospective ground in the Knee-Oxford lakes and Gillam areas. Airborne and ground geophysics and till sampling were conducted by a variety of companies including Valerie Gold Resources Ltd., BHP Billiton/Dunsmuir Ventures, Iriana Resources Corporation, Marum Resources Inc., Kennecott Canada Exploration Inc. and De Beers Canada Exploration Inc. Valerie Gold Resources Ltd. completed drilling at its Crystal property east of Gillam. In the Hudson Bay Lowlands, Foran Mining Corporation acquired a permit in the Kaskattama River area east of York Factory and completed an airborne survey, soil sampling and some ground magnetic surveys on the property.

Rare Earth Metals

Exploration for tantalum- and cesium-bearing pegmatites picked up in the Bernic Lake area in southeastern Manitoba. Companies conducting drilling programs included Tantalum Mining Corporation of Canada Ltd. (Tanco) east of the Tanco mine site, Emerald Fields Resource Corporation east of Bernic Lake, and Avalon Ventures Ltd. near Shatford Lake.

East of Lynn Lake, Rare Earth Metals Corp., with assistance from Hamid Mumin of Brandon University, conducted mapping and prospecting at its Eden Lake rare earth metals property. The company also completed a trenching and sampling program in the fall. The new work documented a carbonatite complex on the property, the first to be discovered in Manitoba.

Industrial Minerals

In southeastern Manitoba, Tanco carried out small pegmatite exploration programs near its Bernic Lake mine. Emerald Fields Resources Corporation continued evaluation of pegmatites on its property east of Bernic Lake.

Cabot Corporation obtained 82% of the world's known reserves of pollucite when it purchased the Tanco mine at Bernic Lake in 1993. A US$50 million cesium formate processing plant was constructed in 1996/97 with an annual production capacity of over 5 million pounds (lb) and employing a staff of 23 people. In January 2001, Cabot announced the first successful drill-in of oil in the North Sea using cesium formate fluid as drilling mud. Later in 2001, the plant was expanded to accommodate the manufacturing of conventional cesium products.

Precambrian granite dimension stone quarries (located approximately 80 km east of Winnipeg) are operated by Manex Granite Ltd. The stone is marketed under the trade names Northern Mahogany, Meditation and Prairie Gold, and is sold from a plant in Transcona on the east side of Winnipeg.

Berger Group Ltd. has leased a sphagnum peat bog, 20 km south of Hadashville in southeastern Manitoba. Sunterra Horticulture (Canada) Inc. has leased a bog, 10 km south of The Narrows on Lake Winnipeg, in the Interlake area. Investigations by both companies have indicated that there are economic resources present and they intend to begin production in the near future.

In southwestern Manitoba, Albchem Manitoba Ltd. completed construction of a sodium chlorate plant as part of a $50 million investment. The plant is located at Hargrave, 10 km west of Virden. The plant is designed to produce 40 000 t/y of sodium chlorate, employing 26 full-time people and contributing $2.5 million to the local economy. Raw material for the plant is salt dissolved from the devonian Prairie evaporite at depth. The site was selected because of its proximity to the salt deposit and favourable electricity rates.

Graymont Western Canada Inc. continues to quarry the high-calcium limestone deposit located near Faulkner in Manitoba's Interlake region. The stone is situated within the devonian Elm Point formation and is calcined into high-calcium lime in a plant adjacent to the quarry.

In 2001/02, Georgia-Pacific Corp. closed its wallboard plant in Winnipeg. The quarry on the west shore of Lake Manitoba, near Harcus, produced gypsum from the jurassic Amaranth formation.

More information on exploration and development in Manitoba is available on the Manitoba Industry, Trade and Mines, Mineral Resources Division web site at www.gov.mb.ca/itm/mrd.

Incentives

The Government of Manitoba has made more than $7.8 million in funding available over a three-year period starting in April 2002 to further encourage exploration and mining investment in the province. The funding is obtainable through the following programs:

Mineral Exploration Assistance Program (MEAP)

The Mineral Exploration Assistance Program (MEAP) provides financial assistance of up to 25% of eligible exploration expenditures to a maximum of $300 000 per recipient per fiscal year to companies or individuals undertaking mineral exploration in Manitoba. The program, established in the fall of 1995, aims to increase mineral exploration and stimulate activities that may lead to the development of new mines and industrial mineral deposits. Companies or individuals may qualify for up to 35% of eligible exploration expenditures to a maximum of $400 000 per recipient per fiscal year in specified areas of the province. MEAP conducts two offerings per fiscal year to coincide with the spring/summer and fall/winter exploration seasons.

MEAP announced its first offering of $1 million in October 1995, followed by $3 million per fiscal year, for three years, beginning January 2, 1996, and ending March 31, 1999. A continuation of the program was approved in June 1998 with $8.25 million of assistance allocated over a three-year period beginning on April 1, 1999. In April 2002, Manitoba reconfirmed its commitment to mineral exploration in the province by renewing MEAP for an additional three years. The program will offer $7.5 million in funding over the three-year period. To further stimulate exploration in areas affected by mine closures, MEAP was expanded to provide a higher percentage of assistance on eligible expenditures for projects in the Lynn Lake/Leaf Rapids area and Bissett region.

PROGRAM HIGHLIGHTS FROM OCTOBER 1995 TO MARCH 31, 2002

- From October 1995 to March 31, 2002, a total of 101 companies have participated in MEAP, representing 297 exploration projects.
- Out of these 101 companies, 65 are considered new to Manitoba, including 7 joint-venture partners. Of the 101 companies, 15 are major exploration companies and 86 are junior compnies (a company is considered to be a major exploration company if its market capitalization is greater than $100 million).
- A total of $13.3 million in assistance has been issued to 297 completed projects.
- A total of $55.5 million in exploration expenses has been reported.
- Reported exploration expenditures under the program indicate that every $1 million in assistance paid generated $4.2 million in exploration expenditures.

Manitoba Prospectors Assistance Program (MPAP)

The Manitoba Prospectors Assistance Program (MPAP) was introduced in 1992 at an annual funding level of $100 000 per year to provide financial support to self-employed prospectors. Qualified applicants received up to 50% of expenditures incurred to a maximum assistance level of $7500 per applicant per year upon completion of the field project and submission of an acceptable report. In an attempt to increase the level of mineral prospecting in Manitoba, the MPAP funding level was increased to $150 000 per year for each of fiscal years 1996 through 1998. Upon evaluation of the program, annual funding for MPAP was decreased to its current level of $125 000 per year in 1999. In 2001, the Prospectors Assistance Program Regulation was amended to increase the assistance available for projects undertaken in more remote areas of the province. For these projects, the regulation provides up to an additional $1500 per year for the cost of chartered fixed-wing aircraft. In April 2002, the Manitoba government renewed MPAP for another three years at its previous funding level of $125 000 per year.

Since inception of the program, 216 projects have been completed with approved expenditures totaling $1 922 862. A total of $961 431 has been paid out.

The summer 2002 program was oversubscribed with 26 applications received for estimated project expenditures of $376 383. Twenty projects were approved for a total of $125 000 in expenditures.

Manitoba Mineral Exploration Tax Credit (MMETC)

The MMETC was introduced by the Government of Manitoba in April 2002 to promote investment in Manitoba-based exploration projects. The MMETC is a 10% non-refundable personal income tax credit for investors in eligible flow-through shares of qualifying mineral exploration companies and can only be applied against Manitoba tax payable. The MMETC will parallel and top up the 15% federal exploration tax credit. Eligible investments and qualifying exploration activity will be tied to federal eligibility, except that substantially all of the exploration activity must be undertaken in Manitoba.

Assay Credit Program

For the 2001/02 fiscal year, the province has allocated $20 000 towards this program. A prospector can earn assay credit coupons for eligible expenditures on exploration work. Coupons can be redeemed for assays of gold, silver, copper, lead, nickel, zinc, molybdenum, chromium, titanium or tin as specified in Manitoba Regulation 64/92. Coupons can also be redeemed for geochemical analysis of other metals not covered in the regulation by obtaining permission from the Assessment Geologist of the Mines Branch.

In fiscal year 2001/02, a total of 8763 credits were issued to 14 prospectors; 8 prospectors redeemed 5593 credits.

More information on Manitoba's mineral exploration and development incentives is available on the Manitoba Industry, Trade and Mines, Mineral Resources Division web site at www.gov.mb.ca/itm/mrd/busdev/incentives.

Land Use

Priorities regarding land-use management focused on the ongoing implementation of the Network of Protected Areas Action Plan. The establishment of areas for protection is conducted through a multi-stakeholder process that includes the Government of Manitoba, the mining and exploration industry, and environmental groups. This process creates a practical balance between environmental preservation and economic development.

Other significant land-use activities included progress towards meeting provincial obligations for Treaty Land Entitlement, the Northern Flood Agreement, and the ongoing implementation of sustainable development as required by *The Mines and Minerals Act*.

More information on land access and sustainable development in Manitoba is available on the Manitoba Industry, Trade and Mines, Mineral Resources Division web site at www.gov.mb.ca/itm/mrd/mines/sustain.

The Mines and Minerals Act

Amendments to *The Mines and Minerals Act* were given Royal Assent on August 9, 2002, and proclaimed on November 1, 2002. The amendments ensure that Manitoba remains competitive and reflect today's trends in exploration. The new laws relate primarily to technical and administrative issues with respect to mineral dispositions, submission of exploration data and confidentiality requirements.

2.8 SASKATCHEWAN[7]

Metallic mineral exploration and production levels remained robust in Saskatchewan in 2002. Reviews given below are organized by commodity, within the Exploration and Production subsections. Actual expenditure levels in mineral exploration for 2001 are given and trends for 2002 are discussed. Activities at all operating mines and concentrators in 2002 are summarized. The exploration and production sections are followed by reviews of mining lands activity and government incentive programs for mineral exploration.

Overview of Exploration

Natural Resources Canada forecasts that, for 2002, mineral exploration expenditures for Saskatchewan will be $27.3 million and that deposit appraisal expenditures will be $14.1 million. This compares to 2001 when Saskatchewan mineral exploration expenditures were $25.6 million and deposit appraisal expenditures were $11.9 million. The Athabasca Basin continues to be the premier district in the world for exploration targeting high-grade uranium deposits. The Fort-à-la-Corne kimberlite field, the largest in the world, with the highest proportion of diamond-bearing kimberlites of any field in the world, continues to be the focus of diamond exploration with major bulk sampling programs continuing.

Uranium

Uranium exploration expenditures are projected to be just under $16 million in 2002, up just over 10% from $14 million in 2001, and accounting for greater than 60% of total annual exploration expenditures in the province. Deep geophysical targets, mainly electromagnetic (EM), but also gravity and induced polarization (IP), delineate primary drill targets associated with major structural breaks below the eastern part of the Athabasca Basin; these targets are then refined within the context of sophisticated exploration models that integrate a wide array of stratigraphic, structural and geochemical data.[8] Although industry leaders COGEMA Resources Inc. and Cameco Corporation account for much of the work in the Basin, more than a dozen companies are currently active.

Aggressive underground mine exploration was done at McArthur River in 2002, and surface programs were done at the Cluff Lake, McClean Lake and Eagle Point mines as well. At McArthur, drilling by Cameco focused on along-strike continuation of ore zones to the south along the P2 fault system; current underground development on the 530, 560, 580, 620 and 640 levels provided access for drilling. At McClean, a 2001/02 winter drill program by COGEMA focused on the Sue trend. Surface drilling was mostly within a few kilometres northwest of the Sue C pit in the Caribou Lake area where two holes collared multiple intervals of ore grade and thickness; the best intersections were 5.9 m of 4.61% U_3O_8 in DDH.S-693 and 9.9 m of 4.078% U_3O_8 in DDH.S-700. The Sue C deposit is mined out, the Sue A and B deposits might be mined sometime after 2004, and a third known deposit, Sue E, is currently being evaluated. COGEMA also completed an aggressive surface program at Cluff Lake in the search for new ore to complement current stockpiles that will be depleted by the end of 2003. Similarly, Cameco completed surface drilling this summer at Eagle Point, and underground drilling, which began in September, will carry on through to 2003. Both campaigns are targeting extensions to known ore trends; current reserves at the Eagle Point mine will provide about three years of mill feed for the concentrator facility at Rabbit Lake.

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[7] The Saskatchewan review of activities was prepared by Gary Delaney. For more information, the reader is invited to contact Mr. Delaney by telephone at (306) 787-1160 or by e-mail at gdelaney@ir.gov.sk.ca.

[8] Thomas, D.J., Matthews, R.B., and Sopuck, V. (2000). Uncomformity-type uranium deposits: exploration model, current mine developments, and exploration directions. *Geology and Ore Deposits 2000: The Great Basin and Beyond.* Geological Society of Nevada, Proceedings, May 15-18.

Kennecott Canada Exploration Inc. is currently earning a 65% interest in the Moore Lake property. Diamond drilling continued in 2002 with the completion of seven new holes. Ore grade and thickness were obtained from DDH ML-25, which contained 4.8 m of 1.2% U_3O_8. Pioneer Metals Corporation, Cameco, and DF Exploration Uranium Ltd. have numerous, active exploration properties in the Riou Lake, Black Lake and Hidden Bay areas; Cameco and Pioneer formed a new company called UEX Corporation to systematically explore a "pooled" land position in these areas.

Gold

Gold exploration is depressed compared to the late 1980s, but the strong gold potential of the La Ronge and Glennie domains within the Reindeer zone of the Paleoproterozoic Trans Hudson Orogen continues to draw some attention. The renewed interest in the Waddy Lake Gold camp is the most important development in 2002 with the aim to renew gold production from the historic camp.

Golden Band Resources announced in April that, through a letter of agreement with Cameco and Golden Rule Resources Inc., respective properties in the Waddy Lake camp in the La Ronge Gold belt were consolidated into a core holding that would be the focus of renewed and focused exploration. In May, Golden Band, in cooperation with Masurapia Gold Corp. and Viceroy Gold Corp., announced a pending acquisition of the Jolu mill in the centre of the camp, and in November it began solidifying 100% ownership of all of the said properties.

The Waddy Lake Camp dates back to the 1940s when pan concentrates of gold were obtained from quartz vein material sampled during reconnaissance prospecting of the La Ronge belt. In Waddy Lake, polyphase plutons intrude mafic and felsic volcanic rocks. Gold occurs in sulphide-bearing veins within shear zones that crosscut both plutonic and metavolcanic rocks. Gold deposition is concentrated where younger faults intersect the regional shear zones. Extensive exploration was done beginning in 1972, underground development began in 1987, and a 400-t/d mill was constructed in 1988 to process ore from the Jolu mine, which produced more than 200 000 oz of gold in about three years of operation. Current drill-indicated reserves for seven deposits in the camp are 2.98 Mt at 8.66 g/t gold.

In 1996, Golden Band began to earn into properties in the camp held by Golden Rule by completing detailed mapping, ground geophysics, and diamond drilling around the Tower East deposit and its land position in the camp has increased steadily since then. Recent exploration includes an 800-m drill program on the Memorial and Kruger Lake deposits in the 2001/02 winter season; one hole at Kruger included a 2-m intersection grading 18.2 g/t gold. Work in the summer season of 2002 included road building, and grid refurbishment and mapping, with plans for a follow-up drill program in the 2002/03 winter season.

There was also exploration around the Seabee mine, which was discovered at the same time as the Waddy Lake camp. The deposit is a shear-zone hosted lode gold deposit, hosted within the multiphase gabbroic Laonil Lake intrusive complex. Exploration by Claude Resources Inc. was on the Currie Rose claim group, which surrounds the mining leases and covers vein systems comparable to those at the mine.

During the 2001/02 winter drill program, targets to the north and west of the mine were tested, namely Porky Lake, Herb Lake, Scoop Lake and Bird Lake; follow-up drilling is planned for the 2002/03 winter season, pending sample results from intersected vein and shear zone systems. Drilling at Pine Lake identified rootless vein systems that do not warrant follow-up.

There were also encouraging results from detailed mapping and sampling done in 2002 east and north of the mine. Geochemistry of alteration zones associated with eastern extensions of the discovery zone under Porky Lake defined two trends for a potential winter drill program. In addition, concurrent winter drilling at Portage Lake is being considered based on anomalous gold values in grab samples from a system of veins within the Portage Lake monzonite body.

The Greywacke showing was discovered in 1988. It is at the south end of the La Ronge gold belt, within Paleoproterozoic metavolcanic rocks. Gold occurs within a wide, diffuse zone about 500 m long that is truncated by the Missinipi fault. At the south end of the zone, gold is within a highly magnetic, silicified, pale grey felsic volcanic rock, and at the north end, gold is within massive mafic volcanic rocks cut by quartz-feldspar porphyritic dykes. Work by Cameco between 1989 and 1994 culminated with the completion of a 50-hole diamond drill program. The best result was 4.29 m grading 10.7 g/t gold from the north zone, and Cameco calculated a drill-indicated resource of 328 000 t at 9.26 g/t gold.

Masuparia Gold Corporation optioned the Greywacke property from joint owners Shane Resources and JNR Resources in May 2001, and had completed 25 holes totaling 2030 m by May 2002; the best intersection was from the north zone and included 10.4 m grading 5.59 g/t gold. Masuparia now interprets gold deposition from a hydrothermal system superimposed on a VMS deposit and, as such, significantly increased its land position based on 25 km of new strike-length potential based on the regional distribution of volcanic rocks. An aggressive summer program in 2002 on the new ground included airborne geophysics, detailed lake sediment and soil geochemistry, mapping and prospecting. Diamond drilling was also planned for the Greywacke North, Central and South zones with drilling in the 2002/03 winter season dependent on results from the summer work.

Base Metals

There was limited exploration in the Flin Flon camp in 2002, but there was extensive work done farther to the southwest, under the cover of lower Paleozoic shelf carbonate strata. Targets are VMS systems within Paleoproterozoic metavolcanic rocks in the southern extension of the Hanson Lake block.

Hudson Bay Exploration and Development Company Limited completed an extensive follow-up of Spectrum anomalies, including a 2578 m, 11-hole diamond drill program around Namew Lake, and two holes totaling 843 m in the Suggi Lake area, farther under the cover. Hudson Bay is currently operating the Callinan and Trout Lake mines in the Flin Flon camp and developing the 777 deposit.

Aur Resources, in partnership with Troymin Resources Ltd., continued systematic grass-roots exploration in the Hanson Lake and Bigstone Lake areas of the La Ronge Domain. Exploration is focused on geophysical targets along strike from the McIlvena Bay VMS deposit, hosted in Paleoproterozoic metavolcanic rocks under a cover less than 50 m thick of Lower Paleozoic shelf carbonate successions. In 2001, Aur completed 48 line-km of TEM and magnetic ground geophysics on three separate grids, and systematically soil sampled all EM anomalies using partial extraction techniques. Follow-up work in 2002 included an additional 37 line-km of TEM/magnetic surveys and a 1744-m, 6-hole diamond drill program to test geologic and EM targets near Hanson Lake. New sulphide intervals have been intersected and one hole contained 4.65 m with 0.62% copper, 0.55% zinc and 2.3 g/t silver. Down-hole EM surveys were completed and follow-up of conductors in 2003 is being evaluated.

Copper-Nickel and Platinum Group Metals

Exploration for platinum group metals was low in 2002, following a renewal of interest beginning in 1999 when Golconda Resources Ltd. acquired a large land position within the Peter Lake complex in north-central Saskatchewan. Land under disposition decreased in 2002, but still amounts to nearly 95 000 ha with Golconda still the principal player amongst numerous junior companies and individual stakeholders.

The Peter Lake Domain is one of the largest layered, mafic-ultramafic complexes in the world, and the geological potential for platinum group metals within layered cumulate bodies is well established, based on regional and detailed lithogeochemistry, mineral chemistry, and correlation with the fertile Bushveld and Stillwater complexes.[9] Previous reconnaissance programs document regional-scale trends and well defined cumulate-layered intervals with greater than 4 g/t palladium plus platinum. Golconda refined targets during a 1999 reconnaissance sampling program and completed first-phase drill testing (4 holes, 420 m) in 2000 that defined a "band" about 500 m wide with elevated PGE associated pyrite-pyrrhotite-pentlandite (py-po-pent) concentrations.

Like the Peter Lake Domain, exploration levels decreased in the Glennie Domain to the east; favourable results from work done in 2001 by Golconda Resources Ltd. were not followed up in 2002. Work included drill testing of geophysical anomalies associated with the contact of post-tectonic, zoned polyphase plutonic bodies with Paleoproterozoic mafic and felsic metavolcanic rocks, and lesser metasediments. Several intervals up to 60 m thick of disseminated, stockwork, semi-solid pyrrhotite, with lesser chalcopyrite and sphalerite, were intersected within massive metabasalt; elevated abundances of platinum and palladium were detected locally in the contact areas of the post-tectonic plutons.

There was also renewed activity in 2002 at the historic Rottenstone mine, located centrally in the Rottenstone Domain in north-central Saskatchewan. BHP Billiton Diamonds Inc. entered into an option agreement with owner Uravan Minerals Inc. in 2001. New gravity and EM surveys were completed, and interpreted in the first quarter of 2002 and a 6-hole reconnaissance drill program to test Tier 1 targets began in August. The mined-out deposit is in a narrow sill of pyroxenite-harzburgite surrounded by migmatitic gneiss which is itself within a more extensive terrain of presumed Paleoproterozoic, biotite, tonalite and trondhjemite.

Cominco did the first systematic evaluation of Rottenstone and published drill-indicated reserves as early as 1929. Sporadic work by an array of owners was done until the mining lease finally lapsed in 1959. It was restaked in 1962, and between 1965 and 1968, 28 724 tons of ore were produced from a single open pit by Rottenstone Mining Ltd.; at the time, mineable reserves were 40 000 tons at 3.23% nickel, 1.83% copper, 4.8 g/t platinum, 3.4 g/t palladium, 1.03 g/t gold, and 6.9 g/t silver. The deposit was inactive until Claude Resources Inc. rejuvenated geophysical exploration in 1988 and partnered with Inco in 1990 to continue evaluation. Uravan acquired the property in 1998 and quickly conducted airborne and ground geophysics; within two years it had completed some 14 holes totaling 2845 m and identified 5 additional ultramafic sills with elevated nickel contents.

Current mapping in the central part of the Peter Lake Domain by Maxeiner and colleagues at Saskatchewan Industry and Resources is updating the igneous, thermotectonic and structural history of the domain as a whole.

Rare Earths

Rare earth elements are found concentrated in allanite-apatite-bearing vein, fracture and shear zone systems within Archean granulitic gneiss terranes north of the Athabasca Basin, commonly near lithotectonic domain boundaries. Showings have been reported since the 1950s but systematic exploration has only begun recently.

Daren Resources Ltd. began systematic exploration in 1996 around the historic Hoidas Lake allanite showing located some 40 km northeast of Uranium City. Great Western Minerals Group Ltd. is currently earning an interest in the property. Previous work by Daren has delineated a 10-km-long fault trace with 26 separate rare earth showings. Trench sampling along a 400-m strike on one showing named the JAK zone outlined a central shear zone with an average of 4.9% total rare earth oxides across 3.2 m. The zone was drill intersected along 450 m of strike, and to a depth of 65 m, in

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[9] Hulbert, L., Duke, J.M., Eckstrand, O.R., Lydon, J.W., and Scoates, R.F. (1988). *Geological Environments of Platinum Group Elements*. Geological Survey of Canada, Open File 1440.

2001, with a resource calculation by Sierra Mineral Management Inc in 2002 of 1.14 Mt containing a total of 48.926 g/t rare earth elements (REE), including 20.675 g/t CeO_2, 9.851 g/t La_2O_3, 11.154 g/t Nd_2O_3, 3.000 g/t Pr_6O_{11} and 1.729 g/t Sm_2O_3.

Rare earth elements are grouped into fault-controlled skarn deposits and fault-controlled granite-hosted vein deposits. Both types are amenable to cold acid leaching with greater than 98% recovery, such that an open pit-heap leach operation is being evaluated. Continued metallurgical testing was done in the summer of 2002 by Great Western, and there are plans for a winter program of ground geophysics covering 12 showings south of the JAK zone with subsequent follow-up drill testing of anomalies.

Further to the east, mainly Archean crystalline rocks of the Dodge Domain are prospective for REE concentrations. Leader Mining International Inc. acquired ground in 2001 covering historic, GSC tantalum-cesium-rubidium-tungsten multi-element lake sediment anomalies located in the Bright Lake area some 70 km north of Stony Rapids. Systematic lake and stream sediment geochemistry and lithogeochemistry were completed across the entire 15 km by 40 km property by November of the same year. Pegmatite bodies associated with ophitic granite were identified, some up to 2 km long and 500 m wide. Detailed mapping was done in the summer of 2002, 304 samples were submitted for geochemistry, and a follow-up winter drill program is planned.

Current mapping in the Beaverlodge Domain to the east of Tantato by Ashton and colleagues at Saskatchewan Industry and Resources is updating the geologic framework for the Hearn Province north of the Athabasca Basin, including distinction of igneous suites, age constraints for plutonic and thermotectonic events, paleotectonic reconstructions, and structural setting.

Diamonds

There was resurgence in diamond exploration in Saskatchewan in 2002. Land under disposition in the Fort-à-la-Corne district increased 35% from 2001 to over 600 000 ha; expenditures by some 20 companies are forecast to increase by more than 50% compared to the $4.77 million spent in 2001. An advanced bulk sampling program is under way by the Fort-à-la-Corne joint venture at the 140/141 pipe, Shore Gold Inc. continues economic modeling of the Star pipe based on 2001 bulk sampling, and Great Western Minerals has rejuvenated exploration at the Candle Lake pipe.

There are a number of factors that have fostered the revival of diamond exploration in the Fort-à-la-Corne district. Land title is unencumbered, local infrastructure is good, the understanding of the kimberlite facies is improving via ongoing integrated research by companies and government researchers, and improved provincial royalty and tax structures are being considered.

The Fort-à-la-Corne (FALC) field was discovered in 1988. Following an initial compilation of aeromagnetic data from the Geological Survey of Canada (GSC), kimberlite was drill intersected in some 69 bodies during the next four years. During the initial "boom" of activity, some 4 Mha of land were under disposition and, by 1994, annual exploration expenditures for the province exceeded $10 million. Today, FALC is considered to be the largest kimberlite field in the world, containing the largest individual bodies of kimberlite in the world. Most kimberlite at FALC constitutes extrusive, pyroclastic facies that range from 2.7 to 250 ha in size. Kimberlite is mid-Cretaceous in age and all known occurrences are under some 100 m of unconsolidated drift cover.

Fort-à-la-Corne Joint Venture

The FALC joint venture is between De Beers Canada Exploration Inc. (operator, 42.25%), Kensington Resources Ltd. (42.25%), Cameco Corporation (5.5%), and UEM Inc. (carried at 10%). The agreement covers some 63 kimberlite bodies.

Midway through 2002, macrodiamond recovery results were announced from the 2001 bulk sampling program. The program included 10 large-diameter reverse circulation holes on the 141 and 150 bodies, designed to minimize breakage and maximize recovery and thereby increase the confidence levels for modeling/extrapolating diamond grade and value. The mini-bulk samples totaled 889.8 kg of kimberlite. A three-stage process of screening, heavy liquid separation, and final recovery was done to retrieve all macrodiamonds exceeding 1.5 mm in size. A total of 463 macros were recovered from the 141 and 150 bodies with a total weight of 41.85 ct. The 141 body was the most productive, with 9 stones between 0.3 and 0.5 ct and 7 stones over 0.5 ct. Preliminary modeling of data forecasts a possible range in diamond value of between US$90 and $179/ct (standard selling value) for macrodiamonds larger than 1.5 mm with an associated ore value of between US$17 and $32/t.

In July, a significant announcement was made regarding the success of the more sophisticated recovery technique used for the bulk samples. Three previously unreported macrodiamonds were recovered from the upper portion of 141, including the largest yet recovered in the FALC joint venture, a 3.335-ct diamond recovered from traditionally unprocessed, clay-rich DMS concentrate. Two additional stones weighing 0.28 and 0.125 ct, respectively, were also recovered from a routine audit of +4-mm tails material from two separate holes completed during the 2001 program. Material was also sent to Lakefield Research Ltd. for more complete recovery analysis. Lakefield carried out caustic dissolution techniques targeting complete recovery of diamonds to a lower limit of 0.074 mm. A total of 267.67 kg of material in 32 samples from 158 m of kimberlite in hole 141-09 yielded 153 microdiamonds with a total weight of 0.065 ct, and a total of 227.54 kg of material in 28 samples from 140 m of kimberlite in hole 141-12 yielded 171 microdiamonds with a total weight of 0.078 ct.

Based on these results, the joint venture gave approval in October 2001 for a $5.2 million program to be carried out in 2002 on the 140/141 kimberlite. The program combines "blue sky" exploratory core drilling and large-diameter reverse circulation drilling for bulk sampling. A total of 23 core holes were planned to explore for new diamond-rich zones within the kimberlite and to provide a more complete understanding of the pyroclastic kimberlite facies throughout 141. Eight reverse circulation holes were planned, to be collared based on results from the coring program, and drill engineered to provide enhanced recovery data for better grade and value modeling.

The first phase of the program was completed between September 5 and October 9. Twenty-three cored holes were completed in the central part of 141 and the southern portion of nearby 140. Drilling of five 24-inch-diameter reverse circulation holes and three 36-inch-diameter reverse circulation holes are targeted for completion at the end of November. Additional work in 2002 will include initial ore dressing studies, which will be used to refine preliminary revenue modeling for 141, already begun by De Beers based on forecasted thresholds for depth, thickness, tonnage, grade and value.

Star Kimberlite

Economic modeling of the Star Kimberlite, located at the southern margin of the FALC field, continued in 2002. Shore Gold Inc. is the sole owner. Star comprises both diatreme and pyroclastic facies that cover an area of 4 km^2 and range in thickness from 3.0 m to 540 m. Drill-indicated resources at Star are 500 Mt of kimberlite with an average thickness of 88 m, using a cut-off thickness of 30 m.

Phases I and II drill testing of Star was completed in the 2000/01 winter drill season. Prior to initiating a 25 000-t bulk sampling program, Shore Gold drilled a single 24-inch-diameter reverse circulation hole in October 2001 to obtain a mini-bulk sample. The hole intersected 192.37 m of continuous kimberlite and provided 82.7 t of kimberlite for analysis. Material was crushed to <8 mm and processed at the De Beers dense media plant in Grand Prairie for final diamond recovery of the +1 mm material; the remaining +1 mm DMS lights material was retained for optional auditing later.

Results from the 2001 bulk sampling were announced in May 2002. Material greater than 1.1 mm was processed and a total of 184 macrodiamonds were recovered with a total weight of 8.52 ct. The two largest stones were both fragments and weighed 0.64 and 0.4 ct, respectively. All kimberlite was screened to +1.2 mm at the drill site such that microdiamonds smaller than this would not have been recovered in the DMS plants. Shore is encouraged by these results and, beyond the diamond counts, cites two specific reasons for continuing to engineer a 25 000-t bulk sampling program: (1) size analysis confirms that there was over-grinding of kimberlite in the mini-bulk sample such that diamond counts are considered to be a minimum; and (2) Lakefield Research confirmed the presence of eclogitic minerals that suggests an eclogitic mantle source for Star and raises the prospectivity for high grades.

Other Fort-à-la-Corne Activity

The Candle Lake Joint Venture (CLJV) between Great Western Diamond Corp., a subsidiary of Great Western Minerals Group Ltd., and War Eagle Mining Co. Inc. covers two large diamondiferous kimberlite bodies, 28 and 29/30, at the north end of the FALC district. Great Western is earning an 80% interest in the property by carrying War Eagle's 20% through to completion of a bankable feasibility study.

Previous core drilling on the CLJV resulted in the recovery of 70 macrodiamonds and 343 microdiamonds from 3.67 t of core samples. The tonnage estimate for the two separate bodies is 78 Mt combined and the forecast grade is 27 ct/t. These results are comparable to results after similar stages of exploration on all other kimberlite bodies from the southern part of the field, including Star and 140/141. Furthermore, regional compilation of indicator minerals shows clearly that the Candle Lake bodies have higher G10 garnet counts than anywhere else in the field and are top-ranked with respect to diamond inclusion counts in chromites.

A four-hole drill program was planned in 2002 on the 28 and 29/30 pipes. The primary objective for three holes near the 29/30 pipe was to obtain a better understanding of the geology of the bodies in order to plan a future bulk sampling program and to have a better framework for economic modeling. One hole was a "blue sky" test of a potentially new pipe near kimberlite 28. All four holes were based on EM resistivity anomalies.

Only the three holes on the 29/30 kimberlite were drilled. One hole on the periphery failed to intersect kimberlite and the two holes that in-filled gaps in previous drilling of 29/30 intersected 75 and 107 m of kimberlite, respectively. Preliminary counts from 170 kg of material from 25 samples are 126 diamonds of which 5 are macros (one dimension > 0.5 mm). This is the highest count per kg from the Candle Lake area and the focus now shifts to planning, and fundraising, for a bulk sampling program in 2003.

In addition to the major programs at the 140/141, Star and Candle Lake kimberlites, there was early-stage evaluation of numerous targets by an array of junior companies in 2002. Below is a brief list of some of this work.

- Buckshot Holdings Ltd. and Commando Holdings Ltd.: FALC targets immediately surrounding the De Beers joint venture ground.
- JNR Resources Inc. and United Carina Resources Corp.: targets along, or adjacent to, lineaments that are northwest extensions of lineaments associated with the main FALC kimberlite clusters and trends.
- Pan Terra Exploration Corp., United Carina Resources Corp. and Consolidated Pine Channel Gold Corp.: Diamond Lady kimberlite east of the FALC joint venture, and Smeaton properties located farther to the west; detailed geophysics is planned for 2002 with potential drill testing follow-up in 2003.
- Skeena Resources Ltd. and General Resources Inc.: three separate properties northwest along strike from FALC kimberlite trends.

- Skeena Resources Ltd. and Shore Gold Inc.: two large kimberlite bodies northwest along strike from FALC trends; detailed airborne geophysics planned for 2002, with potential drill testing follow-up in 2003.
- Skeena Resources Ltd.: no further work warranted in 2002 on two kimberlite bodies in the FALC district, near Weirdale, based on negative results from 2001 drill testing; additional airborne geophysics will be done on as yet untested regional anomalies located on the property.

Overview of Production

Uranium

Saskatchewan continued to be the world leader in uranium in 2001 and 2002, accounting for 100% of production in Canada and over one third of Western World production. In 2001, total Saskatchewan production was approximately 12 586 t of uranium (32.72 million lb U_3O_8) from five operations in the Athabasca Basin. Mining ceased at two operations in 2002 (Cluff Lake and McClean Lake), leaving McArthur River and Rabbit Lake as the sole producers at year-end. Milling of stockpiled ore will continue until the end of 2002 at Cluff Lake, and continues at Key Lake where it is blended with ore from McArthur River. Similarly, milling of stockpiled ore will continue at McClean Lake for some three years prior to receiving ore from the Cigar Lake mine, targeted for production in 2006. Industry leaders Cameco Corporation and COGEMA Resources Inc. control 57% and 35%, respectively, of known reserves in the Athabasca Basin and operate all of the aforementioned mines.

The industry average spot price for uranium on September 30, 2002, was US$9.75/lb U_3O_8; a year earlier it was US$9.50/lb U_3O_8.

KEY LAKE MILL/McARTHUR RIVER MINE

Key Lake (83.333% Cameco Corporation, 16.667% COGEMA Resources Inc.), the largest high-grade uranium milling operation in the world, produced 6938 t of uranium (18.04 million lb U_3O_8) in 2001, primarily from McArthur River ore. Stockpiled ore from the Key Lake mine provided 299 t of uranium (0.78 million lb U_3O_8) of this total. For 2002, Key Lake production is planned to be 7193 t of uranium (18.7 million lb U_3O_8) with Key Lake stockpiled ore providing 142 t of uranium (0.37 million lb U_3O_8). McArthur River is the world's largest high-grade uranium deposit with proven and probable reserves of 182 245 t of uranium (473.8 million lb U_3O_8) and an average grade of 19.51% U (23% U_3O_8).

RABBIT LAKE

Cameco Corporation announced the restart of its 100%-owned Rabbit Lake uranium operation midway through 2002; discovered in 1968, the first of the so-called "unconformity-type" deposits in the eastern Athabasca, the revitalized mine is now the longest running uranium operation in Saskatchewan. Underground production at the Eagle Point mine resumed in the fourth week of July and milling at the Rabbit Lake concentrator facility commenced in August. Operations at the Eagle Point mine had ceased in 1999 due to depressed uranium prices and the mill at Rabbit Lake was shut down in 2001. Total production in 2002 is expected to be 962 t of uranium (2.5 million lb U_3O_8), ramping up to 2308 t of uranium (6 million lb U_3O_8) on an annual basis.

Current reserves at the Eagle Point mine are approximately 19 million lb of U_3O_8, which will provide feed for the Rabbit Lake concentrator for at least three years with ongoing exploration drilling being done to establish additional reserves. In the latter part of the decade, the Rabbit Lake concentrator facility will be dedicated to processing some of the ore from the Cigar Lake mine, which is planned for start-up in 2006, subject to market conditions, regulatory approval, and construction schedules.

CLUFF LAKE

The last day of mining at COGEMA Resources Inc.'s Cluff Lake operation was May 31, 2002. Using stockpiled ore, milling will continue on a one-week-on, one-week-off schedule until the end of 2002. A gradual phased shut-down of the operation will be implemented. The environmental assessment of the shut-down plan is detailed in The Cluff Lake Comprehensive Decommissioning Plan, which is currently being reviewed by various regulatory agencies.

Mining and milling at Cluff Lake began in 1980 and produced more than 23 848 t of uranium (62 million lb U_3O_8). Production is expected to reach 1654 t of uranium (4.3 million lb U_3O_8) in 2002, the highest total at Cluff Lake since 1997 when it produced 1962 t of uranium (5.1 million lb U_3O_8). Cluff Lake open-pit production was from the D, Claude, Dominique-Janine and Dominique-Janine extension operations. Underground production came from the OP, Dominique-Peter and Dominique-Janine mines. A gold mill, added in 1987, recovered 8000 oz of gold and 800 oz of silver.

McCLEAN LAKE

The McClean Lake operation (70% COGEMA Resources Inc., 22.5% Denison Mines Ltd. and 7.5% OURD [Canada] Co. Ltd.) produced 2380 t of uranium (6 million lb U_3O_8) in 2000 and 2585 t of uranium (6.7 million lb U_3O_8) in 2001. The mill processes a blend of SUE low to high-grade and JEB low-grade ores for an average of 2.6% uranium (3.06% U_3O_8). Open-pit mining of the Sue C deposit ended in February 2002, taking approximately three years to complete. The Sue C mine provided 650 000 t of ore grading just over 2% uranium (2.6% U_3O_8) and containing 14 031 t of uranium (36.4 million lb U_3O_8).

Stockpiled Sue C and JEB ore will continue to feed the mill until 2006. In 2001, the company received regulatory approval to raise mill capacity from 2308 t/y of uranium to 3077 t/y. A further mill expansion to 4616-t/y capacity will be completed, pending regulatory approval, in order to facilitate treatment of ore from Cigar Lake, targeted for production in 2006.

CIGAR LAKE

Cameco Corporation became the operator of the Cigar Lake project (50.025% Cameco Corporation, 37.100% COGEMA Resources Inc., 7.875% Idemitsu Uranium Exploration Canada and 5.0% TEPCO Resources Inc.) at the end of 2001 and will operate the production mine. With total proven and probable reserves of 89 045 t of uranium (231.5 million lb U_3O_8) at an average grade of 16.16% uranium (20.6% U_3O_8) and total inferred resources of 45 465 t of uranium (118.2 million lb U_3O_8) at an average grade of 14.35% uranium (16.92% U_3O_8), Cigar Lake is the world's second largest high-grade uranium deposit. Production is not expected before 2005, assuming a positive production decision is made, regulatory approval is obtained, construction is completed, and operating licences are received. Currently, the Cigar Lake project has approval to do a limited amount of site preparation work while waiting to receive approval of its construction licence application, expected in the spring of 2003. An application has been filed to process all of the primary ore slurry from Cigar Lake at the McClean Lake concentrator, operated by COGEMA. If successful, the Rabbit Lake facility, operated by Cameco, would receive only 57% of the yellowcake-bearing pregnant solution from McClean, a proportion originally agreed to for the primary ore.

Gold

SEABEE MINE

The Seabee mine in east-central Saskatchewan was the only primary gold producer in 2002; four other mines, three of which are also in the Reindeer zone of the Mesoproterozoic Trans Hudson orogen, have produced gold in the past. Ore grades improved in the third quarter of 2002 and 11 100 oz of gold were produced from 45 700 t of ore at an average grade of 7.6 g/t (0.22 oz/ton).

This is an improvement over the first half of the year when 15 200 oz of gold were produced from 106 400 t of ore at an average grade of 4.8 g/t (0.14 oz/ton). The mine produced 48 500 oz of gold in 2001. The reduction in grade during the first half of the year was attributed to the completion of mining and milling of the low-grade Currie Rose property D zone during the transition to the higher-grade ore in the B and C zones below the 400-m level. For the first nine months of 2002, total cash operating costs were US$280/oz and the average realized gold price was US$306/oz.

GOLDFIELDS PROJECT

The board of directors of GLR Resources Inc. has given approval to proceed with the development of the Box and Athona open-pittable gold deposits in the historic Goldfields mining camp. The approval is based on an updated in-house engineering study that indicated the project was financially robust given a gold price of greater than $300/oz and a Canadian dollar exchange rate of $1.50 to US$1.00. Gold production is forecast to be 45 000 oz/y averaged over 10 years. The 10-year plan is based on a measured and indicated resource of approximately 500 000 contained oz at a grade of 2.7 g/t (0.08 oz/ton) gold.

Base Metals

The only base-metal production in 2002 was from the Konuto Lake and Callinan mines, within the historic Flin Flon mining camp located on the Saskatchewan/Manitoba provincial border. Both mines are owned and operated by Hudson Bay Mining and Smelting Corporation, a subsidiary of Anglo American Ltd.

KONUTO LAKE MINE

The Konuto Lake mine is a structurally modified copper-zinc Cyprus-type VMS deposit hosted in Paleoproterozoic mafic volcanic rocks, 16 km to the west of Flin Flon, Manitoba. The north-northeast-striking, near vertical dipping, and steeply south-plunging deposit has a strike length of approximately 180 m. The copper-zinc-gold-silver sulphides are in lenses, including four massive sulphide lenses (Lenses 1, 3, 4 and 5), in a broad zone of oblique-reverse faulting. As of January 1, 2002, the deposit's mineable reserves and resources were 1 175 488 t of ore grading 3.93% copper, 1.54% zinc, 2.11 g/t gold and 8.36 g/t silver. Since production began in 1998 to the end of 2001, the mine produced 773 012 t of ore grading 4.49% copper, 1.22% zinc, 2.01 g/t gold and 9.04 g/t silver. From January 1 to October 1, 2002, the mine produced 224 870 t of ore grading 4.19% copper, 2.03% zinc, 2.12 g/t gold and 9.05 g/t silver. Production for the remainder of 2002 is estimated at approximately 77 000 t of ore.

CALLINAN MINE

The Callinan mine (100% Hudson Bay Mining and Smelting Co. Limited, subject to a 6.67% net profits interest agreement with Callinan Mines Ltd.), in the heart of the Flin Flon mining camp, consists of three separate, east-plunging sulphide zones (South, East and North) that are hosted within rhyolite that is correlated with the "mine rhyolite" at the nearby 60 Mt-plus Flin Flon mine. Part of the Callinan North deposit is within Saskatchewan, for which production during the first eight months of 2002 was 61 225 t of ore at an average grade of 1.57% copper, 2.46% zinc, 1.51 g/t gold and 10.9 g/t silver. Mineable reserves in the Saskatchewan portion of the North deposit, as of January 1, 2002, were 675 765 t of ore at an average grade of 1.19% copper, 3.06% zinc, 1.54 g/t gold and 18.32 g/t silver.

In 2002, the McIlvena Bay VMS deposit, west of Flin Flon, was returned to joint owners Cameco Corporation and Billiton Resources by Foran Mining. During its option of the property, Foran completed additional drilling, discovered a new sulphide horizon, and increased reserves by 25%, which are currently listed at 14.5 Mt grading 0.91% copper, 6.08% zinc, 0.45% lead, 0.45 g/t gold and 23.7 g/t silver.

Summary of Mining Lands Activity

Crown Land Tenure Activity

Active: A total of 1025 new "metallic mineral" dispositions covering 726 074 ha were acquired in calendar year 2001. The majority (88%+) of these were in the surveyed part of the province and were related to diamond exploration. The total number of metallic mineral dispositions in good standing on December 31, 2001, was 3463 covering a total of 2.5 Mha.

As of October 31, 2002, there are 3601 dispositions covering 2.48 Mha. Of these, 1983 dispositions covering 686 400 ha are related to diamond exploration in the surveyed southern half of the province (Prince Albert area) and 1506 covering 1.67 Mha are in the northern, unsurveyed part of the province. While the area under disposition remained constant compared to the previous calendar year, this represents an increase in the number of mineral dispositions.

Lapsed/Forfeited: A total of 370 metallic mineral dispositions totaling 390 533 ha lapsed in calendar year 2001. The majority of these were in the northern part of the province.

To October 31, 2002, 442 mineral dispositions totaling 319 323 ha have lapsed, the majority in the southern part of the province.

A comparison of the total number and types of active Crown metallic and industrial mineral dispositions is shown in **Table 14**. There are currently 4541 active mineral dispositions covering 2.8 Mha.

Assessment Work

In 2001, 680 submissions of assessment work were reviewed and $56.6 million in expenditures were approved. Uranium-related assessment work in the Athabasca Basin represented 90% of the approved expenditures while work related to diamond exploration activities represented 6% of approved expenditures.

To October 1, 2002, 581 submissions have been reviewed and $10.8 million of assessment work expenditures have been approved. Uranium-related assessment work represents approximately 69% of the submissions, followed by base metals. Diamond drilling constitutes the bulk of the approved expenditures, followed by ground geophysics.

TABLE 14. SASKATCHEWAN CROWN METALLIC AND INDUSTRIAL MINERAL DISPOSITIONS

Category	December 31, 2001		October 31, 2002	
	(number)	(hectares)	(number)	(hectares)
Mineral claims	3 345	2 370 000	3 489	2 360 000
Mineral leases	116	38 075	111	38 017
Permits	21	87 725	20	87 723
Alkali leases	38	12 700	38	12 700
Coal leases	756	111 864	760	111 872
Quarry leases	94	4 191	113	4 147
Special agreements	1	21 460	–	–
Potash leases	12	217 164	12	217 729
Total	4 381	2 863 179	4 541	2 830 188

Source: Saskatchewan Department of Industry and Resources.
– Nil

Government Incentive Programs

The Saskatchewan government has recently announced a number of initiatives aimed at increasing exploration activity that may lead to the development of new mines.

Saskatchewan Mineral Exploration Tax Credit (SMETC)

In December 2001, Saskatchewan introduced a new temporary 10% tax credit for eligible flow-through share (FTS) investors of mineral exploration companies active in Saskatchewan. The program parallels the new federal 15% Investment Tax Credit for Exploration (ITCE). The intention of the program is to stimulate grass-roots mineral exploration of principally metallic minerals (including diamonds). The non-refundable tax credit applies to eligible exploration expenses incurred on or after October 18, 2000, and before January 1, 2004. As the SMETC is still in its infancy, data are limited and it is difficult to complete a comprehensive analysis or determine trends. The following observations can be made of the first 14 months the program has been active.

- Over $2.6 million in FTS has been raised by offerings that have applied for the SMTEC;
- Approximately $155 000 in tax credits have been issued; and
- uranium and diamonds have been the targeted commodities of exploration programs that have applied for the SMTEC.

Saskatchewan Mineral Exploration Incentives

In September 2002, the Saskatchewan government announced a six-year, $12.6 million package of mineral exploration incentives that includes:

- Prospectors Exploration Incentive Program ($100 000/year);
- Company Exploration Incentive Program ($1.1 million/year);
- Enhanced geoscience funding ($400 000/year) for regional multi-parameter airborne geophysical surveys;
- Ten-year royalty holiday for new gold and base-metal mines;
- Development of a competitive diamond royalty and tax structure; and
- Fuel tax rebate.

The Prospectors Incentive Program offers reimbursement of up to 50% of approved eligible expenditures to a maximum of $7500 per recipient, with a maximum of one approved project per recipient per year upon acceptance of a technical report and expenditure statement.

The Company Exploration Incentive Program offers reimbursement of up to 25% of approved eligible expenditures to a maximum of $100 000 per recipient, with a maximum of one approved project per recipient per year upon acceptance of a technical report and expenditure statement.

Applications for both these programs will be available December 1, 2002, with approved projects identified in early January 2003. Eligible expenses for approved programs for this year's program must be incurred after January 1, 2003, and prior to March 31, 2003. In subsequent years the program is offered, eligible expenses for approved programs can be incurred any time in the fiscal year the program is approved for.

2.9 ALBERTA[10]

Overview

In 2001, approximately 2.5 million hectares (Mha) were staked in Alberta. A brief staking surge occurred during the first quarter of 2002 when 1.2 Mha were applied for. The rest of 2002 has been quiet to date with applications totaling 423 800 ha from April to August. As of December 2001, 8.2 Mha were in good standing, increasing to 11.4 Mha as of August 2002. In 2001, only $2.0 million were filed in assessment, a dramatic drop from the $17.2 million filed in 2000. Exploration in 2001 continued to focus on diamondiferous kimberlites, with lesser attention directed to precious/base-metal deposits in northern Alberta and uranium in the Athabasca Basin in northeastern Alberta.

Exploration for Diamondiferous Kimberlites

To the end of August 2002, a total of 46 kimberlites had been discovered in Alberta: 36 in the Buffalo Head Hills (north-central Alberta), 2 at Mountain Lake (northwestern Alberta), and 8 in the Birch Mountains (northeastern Alberta).

Over 65% of the Buffalo Head Hills kimberlites are diamondiferous, which compares very favourably with worldwide diamondiferous (typically about 10%) versus non-diamondiferous kimberlite distributions in other kimberlite-bearing regions. In 2001 and 2002, Ashton Mining of Canada Inc. conducted further testing of the K252 and K6 pipes. The K252 pipe was discovered in early 2000 under approximately 75 m of glacial overburden. A 22.8-t mini-bulk sample, collected in March 2001, returned 55 carats per hundred tonnes (ct/ht), including a 0.94-ct diamond. A delineation drilling program conducted in February 2002 indicated the K252 pipe is likely less than 2 ha in size and may be too small to commercially develop given the overburden. The K6 kimberlite was discovered in 1997 about 500 m southeast of K252. A ground gravity survey and drilling were conducted in February 2002 at the K6 kimberlite, which is represented by two magnetic anomalies encompassing an area about 250 m by 600 m. Drilling from K6 returned a grade of about 9.4 ct/ht. Ashton continues to explore in the Buffalo Head Hills region.

The Elektra property, about 50 km to the north of Ashton's property, is being explored under a joint venture (Marum Resources Inc., Shear Minerals Ltd. and New Claymore Resources Ltd.). In 2002, Marum followed up results from an aeromagnetic survey previously flown by New Claymore and conducted ground geophysical surveys and drilling at selected targets. Apparently no kimberlites were intersected.

At the Mountain Lake area, New Claymore Resources Ltd. identified two prospective aeromagnetic anomalies a few kilometres west of the Mountain Lake ultramafic bodies. In February 2002, two diamond drill holes, drilled about 600 m apart, intersected a dense magnetic sandstone about 3 m thick at about 55 m depth. This flat-lying layer contained chrome diopside and non-kimberlitic garnets. No further work is planned on this anomaly, but New Claymore intends to continue to search for kimberlites in the area.

In 2000, New Blue Ribbon Resources Ltd. optioned the large Birch Mountains property formerly held jointly by Kennecott Canada Exploration Inc., Montello Resources Ltd. and Redwood Resources. In 2000, New Blue Ribbon drilled a diamond drill hole into the Kendu aeromagnetic anomaly and intersected a kimberlite with favourable indicators, but caustic fusion on a split of the

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[10] The Alberta review of activities was prepared by R. Olson (Alberta Geological Survey). For more information, the reader is invited to contact Dr. Olson by telephone at (780) 427-1741 or by e-mail at reg.olson@gov.ab.ca.

Kendu core did not return any diamonds. As a result, New Blue Ribbon apparently did little exploration in the Birch Mountains area during 2001 and 2002, although some other junior exploration companies (e.g., Tintina Mines Limited) were active on their properties.

Exploration for diamonds also continued in some other parts of Alberta, particularly around Calling Lake where previously collected till, river and beach sediment samples returned abundant kimberlite-indicator mineral grains with excellent chemistries. Samples have yielded at least 66 G10 pyrope garnets believed to be indicative of diamondiferous kimberlite and a single macrodiamond (>0.5 mm). During early 2000, a consultant drilled over 1000 m in 10 holes for Buffalo Diamonds Ltd. to test selected aeromagnetic anomalies, but the consultant held the core in confidence while awaiting payment. In February 2002, BHP Billiton optioned the property from Buffalo Diamonds and New Claymore, paid the outstanding bills, and took possession of the core. None of the holes were reported to intersect kimberlite, but BHP apparently is continuing to explore the area for the source of the diamond indicator minerals.

Exploration for diamondiferous kimberlites also was conducted by various junior exploration companies in other parts of Alberta, including areas around St. Paul, Cold Lake, south of Lake Athabasca, Clear Hills and Chinchaga Hills.

Exploration for Precious, Base and Ferrous Metals

With respect to the somewhat controversial gold/platinum group element/base-metal targets in the Palaeozoic and Cretaceous units of northeastern Alberta, Birch Mountain Resources Ltd. conducted little fieldwork during 2001 and 2002, but recently announced it had reached agreement with Suncor to test selected limestone that is being exposed as a result of ongoing oil sands mining.

In southeastern Alberta, a prospector was reported to have been following up selected geochemical stream silt anomalies that had been identified as possibly prospective for epithermal gold deposits during work done under the Southern Alberta Rift project of the Canada-Alberta Mineral Development Agreement (1992-96).

Exploration for base metals is believed to have been minimal. However, the Alberta Geological Survey, the Lord Geoscience Centre in the Northwest Territories and the Geological Survey of Canada are collaborating under a provincial-territorial-federal Targeted Geoscience Initiative program to assess the potential for Mississippi Valley Type (MVT) lead-zinc deposits in carbonates in northeastern and northern Alberta. Final results are to be released by about April 2004.

Lastly, with respect to ferrous metals, some exploration reportedly is being conducted to re-evaluate the Clear Hills iron deposits northwest of Peace River, Alberta. The prospective zone is a ferroan oolitic ironstone in the late Cretaceous Badheart formation, and prior work has identified an iron resource of over 1 billion t at a grade of about 35% FeO. In southwestern Alberta, near Burmis in the Crowsnest Pass, Micrex Development Corp. acquired the Burmis paleoplacer magnetite deposit. This deposit occurs in late Cretaceous Blairmore group sandstone. Previous work by the Alberta Geological Survey had identified a resource of about 1.92 Mt grading about 25% iron (Mellon, 1961). Micrex currently is evaluating the suitability of the Burmis magnetite deposit for coal beneficiation.

Assessment Report Submissions for 2001

Table 15 shows Assessment Report statistics for 2001 submissions.

Policy Initiatives

The Department, in consultation with stakeholders, developed Alberta's Strategy for Mineral Development in the late 1990s and revised it in 2001. The Minister of Energy favourably received the strategy in January 2002 and the Standing Policy Committee has also approved it. The strategy is awaiting endorsement by Cabinet.

Future Issues

Under the Ammonite Shell Regulation, there has been a moratorium on all new ammonite shell agreements since 1998. The Department hopes to resolve the matter within the next few months with a solution that mitigates future conflict among private landowners, ammonite miners, fossil collectors, and the Crown.

Extraction of non-energy minerals from oil sands tailings has been an on-again, off-again prospect for many years, and several parties have expressed interest in the past year. The key issues are to confirm technical/economic feasibility and to negotiate with oil sands lessees. In a 1990s study sponsored by the Alberta Chamber of Resources, potential annual production from centrifuge tailings was estimated at 68 400 t of high-grade titanium concentrate, 219 000 t of mid-grade titanium concentrate, and 7500 t/y of rare earths. Centrifuge tailings contained about 7% titanium (11.5% titanium oxide) and 1.35% Zr (3.4% zirconium oxide). The high value of titanium grade makes the Fort McMurray centrifuge tailings the second richest resource for titanium oxide in the world. Only Québec's titanium deposit is higher in grade at about 22%.

TABLE 15. ASSESSMENT REPORT SUBMISSIONS IN ALBERTA, 2001

Total number of permits worked on	(a) 255
Hectares worked (no.)	1 957 265
Work expenditures filed ($)	2 001 415

Source: Alberta Department of Energy, Alberta Geological Survey.
(a) 255 permits in 14 filed assessment reports.

2.10 BRITISH COLUMBIA[11]

Summary and Outlook

After four years of declining exploration spending, the British Columbia forecast shows an estimated 57% increase in spending in 2002 over that of 2001, as indicated in **Table 16**.

Significant increases in spending are generally attributed to world-class discoveries, increases in mineral commodity prices, the ability of junior exploration companies to raise risk financing for exploration, and jurisdictions that are pro-active in supporting exploration, development and mining and mineral processing operations. Although less important for generating increased exploration spending, the existence of extensive geography that is well-endowed with a diversity of minerals, deposit types and geological terranes is critical for maintaining healthy levels of exploration, which will guarantee continuous new mine openings and expansions in the future. British Columbia is well endowed with a variety of mineralized terranes and, as indicated by the analysis that follows, has also benefited in 2002 from pro-active government initiatives to enhance its attractiveness for exploration investment.

While every jurisdiction is subject to the fluctuations of internationally traded mineral commodity prices, new discoveries over the past two years in British Columbia and the new administration's supportive policy and legislation have provided important incentives for the increase in provincial exploration spending. In addition, proposed legislation to encourage and expand mineral development is aimed at achieving the government's stated goal "To create $24 billion of investment in mining and energy over the next six years leading to 8000 new jobs."

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[11] The British Columbia review of activities was prepared by Jim Lewis. For more information, the reader is invited to contact Mr. Lewis by telephone at (250) 952-0521 or by e-mail at jim.lewis@gems3.gov.bc.ca.

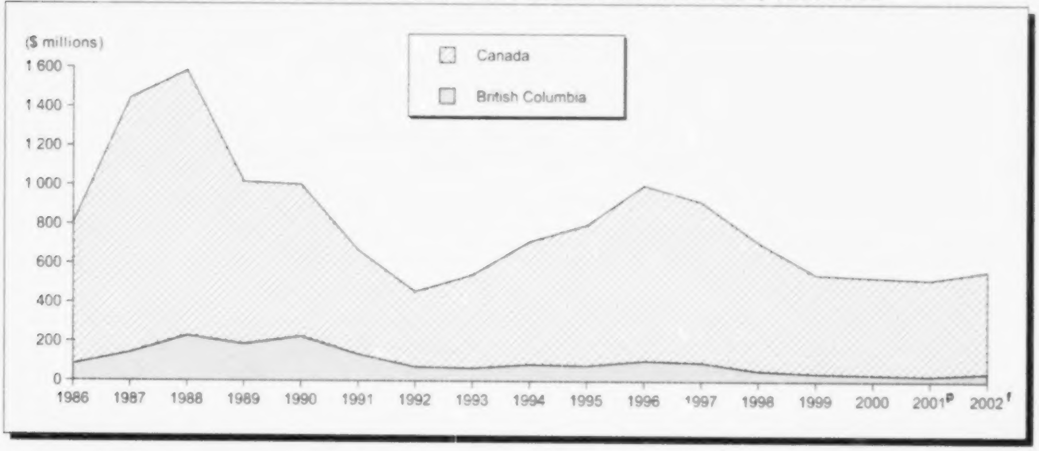
If the history of exploration and mining in the province is any indication of potential, then achieving this goal is quite possible. **Figure 23a** compares exploration spending in British Columbia with total Canadian exploration spending over the last 16 years. **Figure 23b** highlights British Columbia's significant share of exploration spending, in percentage terms, within Canada. This provincial share reached nearly 30% of Canada's total spending in 1990 and, except for the last four years, has maintained levels exceeding 10%. British Columbia expenditures could return to levels of over 10% of national expenditures based on the province's high mineral potential and the new government's positive program for business development. The projected 2002 expenditure in **Figure 23b** reaches 9% of total Canadian exploration.

TABLE 16. EXPLORATION EXPENDITURES IN BRITISH COLUMBIA, 1997-2002

	1997	1998	1999	2000	2001 (p)	2002 (f)
			($ millions)			
Spending	115.2	54.5	41.3	35.9	28.7	44.9
Percent change	..	-53	-24	-13	-20	+57

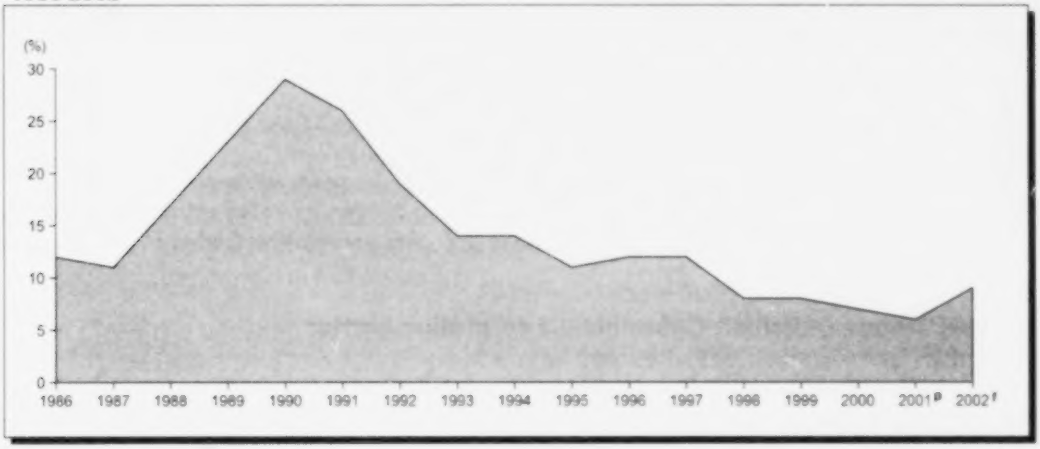
Source: British Columbia Ministry of Energy and Mines.
.. Not available; (f) Forecast of intentions; (p) Preliminary.
Notes: All figures include exploration and deposit appraisal (and exclude mine complex development). In addition to field work and overhead expenditures, statistics include engineering, economic and feasibility studies, environmental and land access spending. Under an NRCan-B.C. Energy and Mines Memorandum of Understanding, all statistics are referenced from the official federal/provincial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures (actual 1997 to 2001 forecast update in mid-2002) and are the source of Statistics Canada's National Accounts.

Figure 23a
Comparison of Exploration Expenditures, British Columbia and Canada, 1986-2002



Source: British Columbia Ministry of Energy and Mines.
f Forecast of intentions; P Preliminary.

Figure 23b
British Columbia's Exploration Expenditures as a Percentage of Canada's Total Expenditures, 1986-2002



Source: British Columbia Ministry of Energy and Mines
f Forecast of intentions, p Preliminary

Government Initiatives

With just under a year and a half in office, the new government has completed a number of initiatives and is reviewing additional actions that are designed to encourage economic growth in both the mining sector and the economy as a whole. In the words of ministry executives, there has been a dramatic shift in the attitude of the administration and regulators to recognize mines as desirable developments within accepted standards in British Columbia. Some of the more important changes are as follows:

- Several tax initiatives have been implemented. The British Columbia Mining Flow-Through Share tax credit program (BC MFTS) provides a 20% tax credit for flow-through financing for eligible grass-roots exploration in British Columbia. The BC MFTS is harmonized with the federal government's 15% flow-through credit to provide tax savings and credits, known as Super Flow-Through Shares, worth up to 62% of share investments.

- Personal income taxes have been reduced by 25%. Corporate capital tax has been eliminated. The provincial sales tax on production machinery and equipment for the minerals industry was removed and corporate income tax was reduced by 3% to 13.5%.

- Through changes,in legislation, the government is working to: implement results-based regulation and standards in exploration, development and mining; streamline regulation; and eliminate duplication of overlapping federal/provincial regulatory functions and move from traditional claim staking towards a map selection system. Changes have been or will be made to the *Mines Act* and its *Health, Safety and Reclamation Code* and the *Environmental Assessment Act*.

- Reforms to the *Mines Act*, for example, will allow the chief inspector of mines to authorize permit exemptions for low-level exploration activities (below the bulk sample level) if the proposed work meets regulation criteria. This change will expedite authorizations on eligible mineral exploration sites.

- The land use planning process is being revised to accelerate completion and ensure results that are more cognizant of economic development opportunities. The government has introduced a two-zone system for exploration and mining land use to ensure that these activities are acceptable, subject to standard environmental legislation, anywhere outside parks and protected areas.

- The Environmental Assessment process has been revised to make it more flexible in accommodating the specific needs of individual proposals.

- The new provincial Energy Plan supports mine-mouth generation of electricity from coal through the implementation of clear emission standards for coal-fired electricity generation.

- Changes in the *Coal Act* allow tenure holders to build access roads without being subject to the higher-level plans of the Forest Practices Code. Tenure holders can also extract gravel from coal tenures for on-site construction and maintenance purposes and harvest timber to gain access to underlying coal.

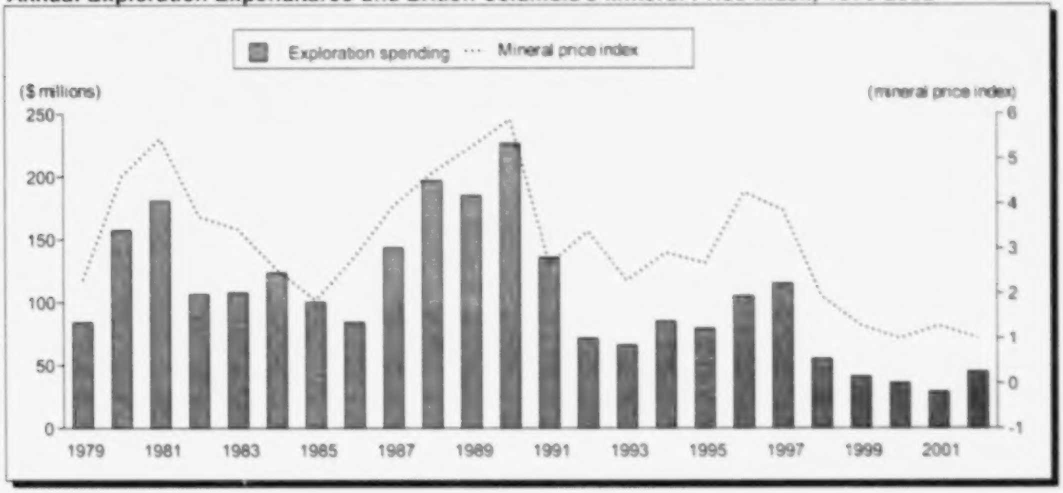
Statistical Trends In British Columbia's Exploration Sector

The trends in British Columbia mineral exploration, as described in this section, are derived from federal/provincial survey statistics and additional data collected by the British Columbia Ministry of Energy and Mines.

Apart from a major world-class mineral deposit discovery, internationally traded commodity prices tend to have the greatest influence on exploration spending. This relationship is illustrated in **Figure 24**, which compares nearly a quarter century of mineral exploration spending in British Columbia with a mineral price index over the same period. The index is made up of copper, zinc, lead, gold, silver, and metallurgical coal prices, whose underlying commodities account for over 80% of British Columbia's exploration spending and mineral revenues.

The most important observation in **Figure 24** is that estimated spending for 2002 is up significantly (57%) from the previous year and brings to an end the four-year downtrend in exploration. Furthermore, the sharp increase in spending is not matched by an increase in the price index. This suggests that the new government's pro-active policies to stimulate exploration, development and

Figure 24
Annual Exploration Expenditures and British Columbia's Mineral Price Index, 1979-2002



Source: British Columbia Ministry of Energy and Mines.
Note: Exploration expenditures for 2002 are based on a forecast of intentions; 2001 expenditures are preliminary.

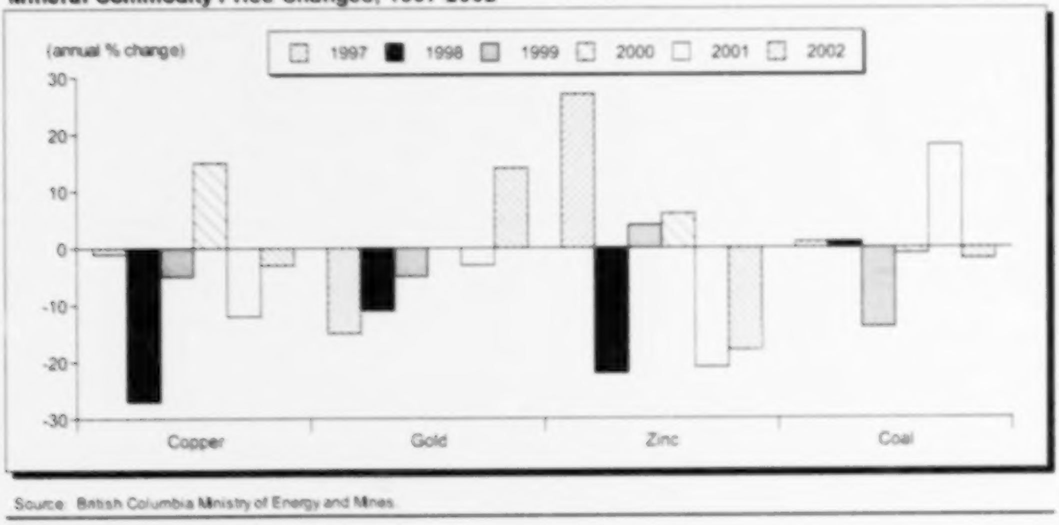
mining operations have provided an incentive for corporations to explore in British Columbia, over and above encouragement from commodity price increases.

Figure 25 looks specifically at the price changes, year-on-year, that affect both exploration spending and total mine sales in the province. With the majority of the bars on the graph plotting below the line (i.e., decreases in prices) over the last six years, financing for junior exploration companies has been difficult to raise and, consequently, exploration spending has decreased. Simultaneously, however, mining operations have maintained a steady $3 billion in annual sales during this period as price increases in one commodity have compensated for price decreases in another. For example, the gold price increased in 2002, the coal price in 2001, copper, zinc and gold prices in 2000, etc. These rotating price increases and the diversity of mineral targets explored for in British Columbia bode well for the strength of future exploration, especially when the government is strongly proactive in encouraging growth in this sector.

Figure 26 shows that increases and decreases in the number of claims staked and the number of free miner certificates issued tend to coincide, year-on-year. Logically, they represent lead indicators in the exploration process followed by permit applications, known as notices of work. Notices of work, as also shown in **Figure 26**, are forerunners to property-based exploration activity. For example, the higher copper, zinc and gold prices of 2000, to some extent, led to increases in claim staking and the issuing of free miner certificates in that year. Subsequently, notices of work increased in 2001 in order to explore these newly staked claims. To some extent, discoveries in 2001 and 2002 (as listed in **Table 17**) led to both an increase in claim staking and a significant increase in exploration spending in 2002.

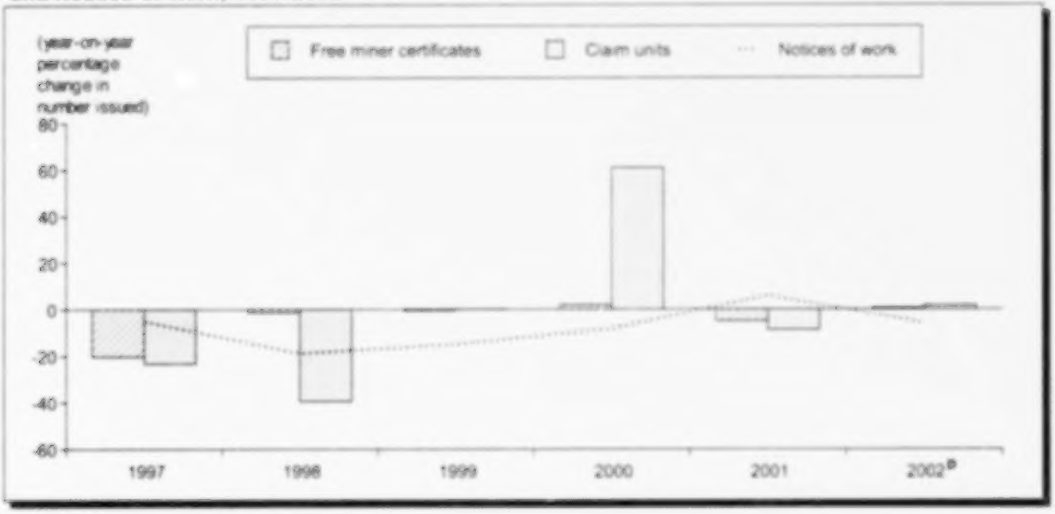
The wide diversity of mineral targets in British Columbia, the presence of a large number of different types of explorers (i.e., prospectors, junior exploration companies, multi-national mining corporations, etc.) and the current administration's focus on economic development are seen as long-term encouragement for exploration in British Columbia. **Figures 27**, **28**, **29** and **30** highlight these factors and their impact on longer-term trends in exploration. **Figure 27** shows the diversity of exploration spending among different mineral commodities and deposit types. **Figure 28** indicates balanced spending over different phases of exploration (i.e., exploration, deposit appraisal and mine complex development), and **Figures 29** and **30** indicate balanced spending across different magnitudes of corporate exploration budgets.

Figure 25
Mineral Commodity Price Changes, 1997-2002



Source: British Columbia Ministry of Energy and Mines

Figure 26
Exploration Activity in British Columbia as Indicated by Free Miner Certificates, Claim Units and Notices of Work, 1997-2002



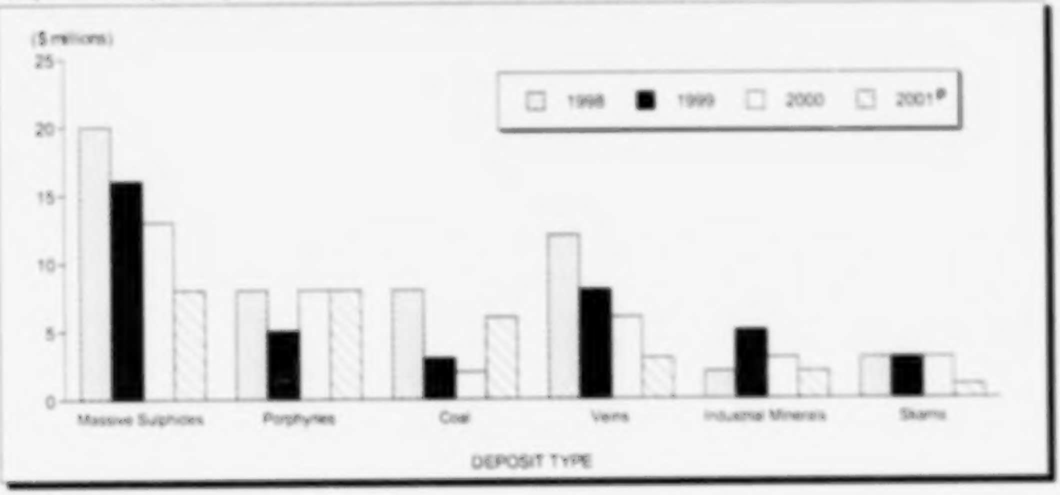
Source: British Columbia Ministry of Energy and Mines.
P Preliminary.

TABLE 17. NEW DISCOVERIES IN BRITISH COLUMBIA, 2001 AND 2002

Project Name	Operator/Discoverer	Deposit Setting	Location
2001			
Bonanza Ledge new zones	Int'l Wayside Gold	Vein-mesothermal	4 km SE of Wells
Cogburn	Leader Mining	Magmatic-Mg	20 km NW of Hope
Dove Creek	Priority Ventures	Coal; CBM	2 km NW of Courtney
DS	Rick Strong, Jim Dyke	VMS-Cyprus	7 km NW of Jordan River
Katt	McClaren & Metcalfe	Magmatic, PGEs, Ni, Co, Cu	60 km NE of Harrison Hot Springs
Kemess North (NE extension)	Northgate	Porphyry Au-Cu	6 km N of Kemess South
Mount Polley (north extension)	Imperial Metals	Porphyry Au-Cu	Mine extension
Prospect Valley	Fairfield Minerals	Vein-epithermal	50 km W of Merritt
Silver Lake	Christopher James Gold	Vein-mesothermal/porphyry	17 km NW of Little Fort
2002			
Del Norte (Rill zone)	Teuton	Veins-mesothermal	30 km ENE of Stewart
DP	Bright Star	Magmatic Cu - PGEs	10 km SW of Tulameen
Eskay Creek (22 Zone)	Barrick Gold	Epithermal VMS	Eskay Creek mine
Fir (Upper zone)	Commerce Res	Carbonatite	20 km N of Blue River
Foremore (SG zone)	Roca Res	VMS - Kuroko	45 km NNW of Eskay Creek mine
Gold Canyon	Black & Buhler	Skarn, VMS?	5 km NE of Burton
Gyll	Dan Epp	Vein-mesothermal	60 km SE of Bella Coola
Hawk (Zulu, Rainbow)	Redcorp	Vein-mesothermal	70 km NW of Germansen Landing
Kemess North (Nugget)	Northgate	Porphyry Au-Cu	1 km W of Kemess North
Mosquito Creek (Kutney)	Int'l Wayside	Vein-mesothermal	4 km NW of Wells
Myrtle	Int'l Wayside	Vein-mesothermal	30 km SE of Wells
Pil North (East zone)	Finlay Minerals	Porphyry Au-Cu	25 km N of Kemess South mine
Pine (VIP zone)	Stealth	Skarn	25 km NW of Kemess South mine
Sib (Battleship Knoll)	Heritage Expl'ns	Epithermal VMS	5 km of Eskay Creek mine
Tas	Navasota	Porphyry Au-Cu	65 km NE of Fort St. James
Thorn (Oban)	Rimfire	High-sulphidation vein	120 km SE of Atlin

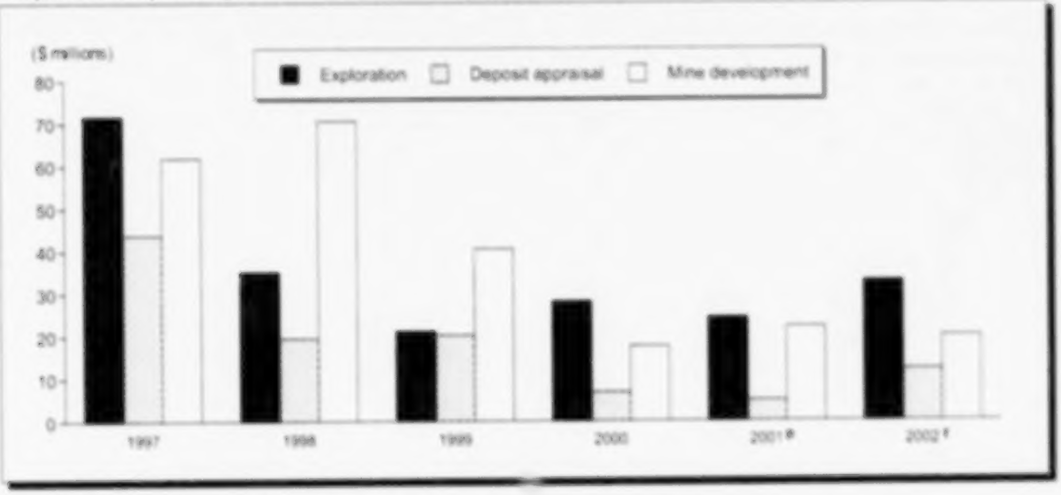
Source: British Columbia Ministry of Energy and Mines.
Au Gold; CBM Coal bed methane; Co Cobalt; Cu Copper; Mg Magnesium; Ni Nickel; PGE Platinum group elements; VMS Volcanogenic massive sulphides.

Figure 27
Exploration Spending in British Columbia, by Deposit Type, 1998-2001



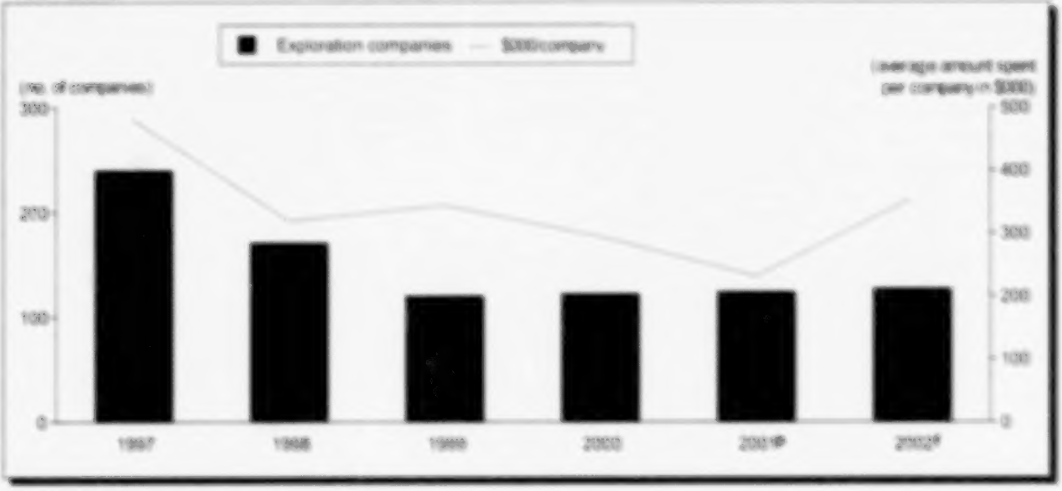
Source: British Columbia Ministry of Energy and Mines.
P Preliminary.

Figure 28
Exploration Spending in British Columbia, by Work Phase, 1997-2002



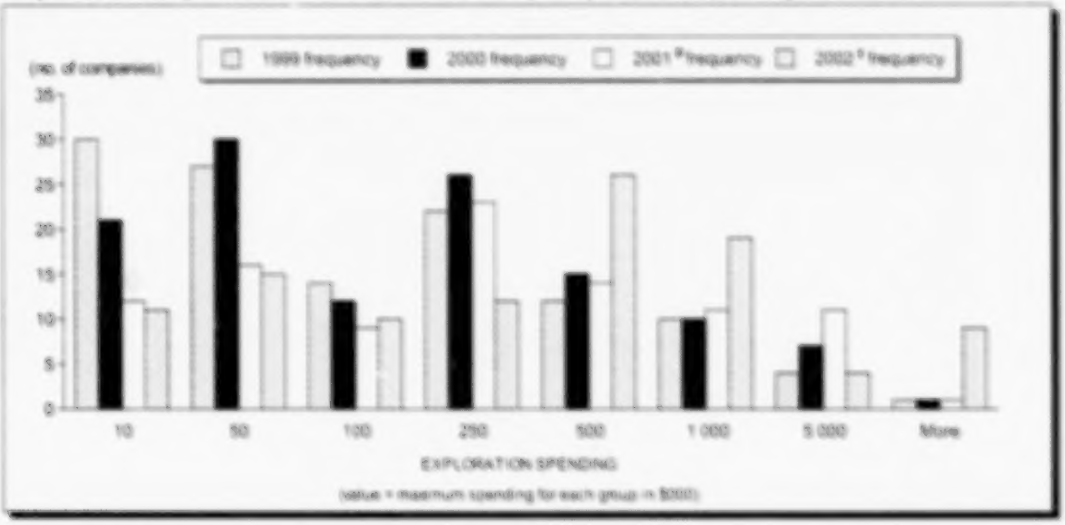
Source: British Columbia Ministry of Energy and Mines.
F Forecast; P Preliminary.

Figure 29
Number of Exploration Companies and Average Amount Spent Per Company in British Columbia, 1997-2002



Source: British Columbia Ministry of Energy and Mines.
F Forecast of intentions. P Preliminary.

Figure 30
Exploration Companies in British Columbia, Grouped by Level of Spending, 1999-2002



Source: British Columbia Ministry of Energy and Mines.
F Forecast. P Preliminary.

Figure 27 shows six separate deposit sectors that have all attracted significant exploration spending through the years. Coal exploration gained some prominence in 2001 as prices rose and as the metallurgical coal industry tended to restructure and consolidate within the southeast coalfields. Porphyries and industrial minerals continuously provide solid targets as indicated by their relatively constant level of exploration spending year-on-year.

While **Figure 28** shows continuous spending in all three phases of exploration, deposit appraisal and mine complex development, there has been an interesting deficit of deposit appraisal spending (i.e., below 50% of exploration spending) over the past three years. It is suggested that this deficit is partly the result of a previous administration that was not viewed as being supportive of mining developments. Interestingly, deposit appraisals are projected to increase significantly and reach 37% of exploration spending in 2002.

In **Figure 29**, the number of companies exploring in British Columbia is compared with the average expenditure per company. While the number of companies has remained relatively constant over the past four years, spending per company is estimated to have increased by over $100 000 from 2001 to 2002. As shown in **Figure 30**, this increase in average spending is the result of increased spending by the "big spenders" (i.e., note the 2002 spikes in **Figure 30** in the $500 000, $1 million, and more than $5 million groupings).

In conclusion, all of these trends indicate that British Columbia has made a significant change in direction towards increasing and attracting exploration spending within the last year and a half. Long-term growth is projected for the exploration sector (i.e., variable year-on-year, but overall a net increase), based on the industry's favourable response through significant increased spending in 2002 and the government's pro-active encouragement for exploration.

Exploration Highlights

Although no recent mineral discoveries of the type that spark immediate world attention and spending have been made in British Columbia, prospectors and companies have found a significant number of new deposits and deposit extensions during the past two years. Large or small, these discoveries are attracting attention and are being scrutinized with even more interest where a pro-active provincial government has put in place one of the best flow-through tax incentives in Canada. **Table 17** lists the new deposits discovered in 2001 and 2002.

Companies and prospectors have explored over 180 projects in 2002. Many of these projects will attract further spending in 2003. While these projects are too numerous to describe here, the following three maps (**Figures 31a**, **31b** and **31c**) show their locations by deposit type and **Table 18** lists them and includes company owners/operators, targeted commodities and deposit settings. The deposits will be discussed further on the ministry web site (www.em.gov.bc.ca/Mining/Geolsurv/Publications/catalog/catexrev.htm) in the *BritishColumbia Mineral Exploration Review - 2002*.

British Columbia has an advantage with its large number and wide diversity of exploration projects, including a wide range of metal, coal and industrial mineral deposits and mineral types. This diversity helps the province avoid some of the business risk associated with mineral commodity price cycles and attracts significant levels of continuous exploration spending.

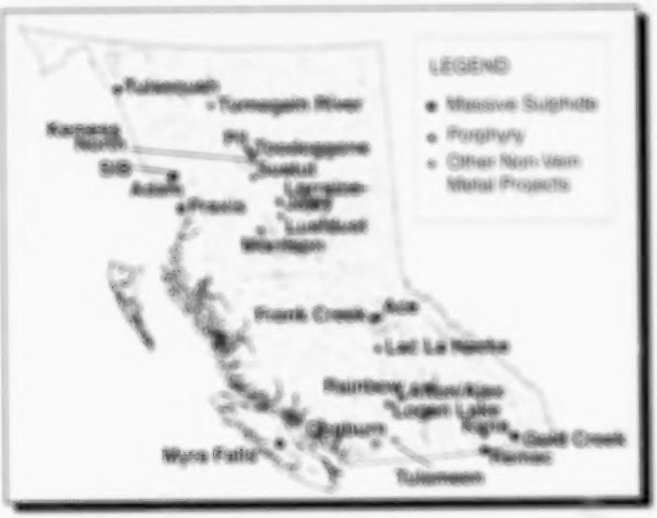
Exploration projects that are expected to attract higher levels of spending in 2002 and/or 2003 are shown in the maps of **Figures 31a**, **31b** and **31c**.

TABLE 18. ANTICIPATED PROJECTS THAT WILL ATTRACT HIGHER LEVELS OF EXPLORATION SPENDING IN BRITISH COLUMBIA IN 2002 OR 2003

Exploration Projects	Company/Operator	Targeted Commodity	Deposit Setting
Ace	Barker Minerals	Au	Skarn
Adam	Rimfire Minerals Corporation	Au	Porphyry
Afton-Ajax	DRC Resources Corporation	Cu, Au, Pd, Ag	Porphyry
Avalgold	Rubicon Minerals Corporation	Au	Vein mesothermal
Blackdome	J-Pacific Gold Inc	Au	Vein epithermal
Cariboo Gold Quartz	International Wayside Gold Mines Ltd	Au	Vein mesothermal
Chappelle (Baker)	Sable Resources Ltd	Cu, Au, Ag	Vein epithermal
Cogburn	Leader Mining International Inc	Mg, Cu, Ni, PGE	Magmatic PGE
DP (Tulameen)	Bright Star Ventures Ltd	PGE	Magmatic PGE
Elizabeth	J-Pacific Gold	Au	Vein mesothermal
Elk (Siwash)	Almaden Minerals Ltd	Au, Ag	Vein mesothermal
Fran	Navasota Resources Ltd	Au, Cu	Vein epithermal
Frank Creek	Barker Minerals	Au	Volcanogenic massive sulphide
Gold Creek	Navasota Resources Ltd	Au	Porphyry
Hawk	Redcorp Ventures Ltd	Au, Cu, Pb, Zn	Vein epithermal
Kemess North	Northgate Explorations Ltd	Au, Cu	Porphyry
Kena	Sultan Minerals Inc	Au	Porphyry
Lac La Hache	GWR Resources Inc	Cu, Au, Mo	Porphyry
Logan Lake	Highland Valley Copper	Cu, Mo	Porphyry
Lone Pine	Golconda Resources	Ni, Co, Sb	Vein mesothermal
Lorraine-Jajay	Eastfield Resources Ltd	Cu, Au, Ag	Porphyry
Lustdust	Alpha Gold Corporation	Au, Ag, Cu, Zn	Skarn
Morrison/Hearne Hill	Pacific Booker Minerals Inc	Cu, Au	Porphyry
Moyie West Block	Klondike Gold Corp	Zn, Pb, Ag	Sedimentary exhalative
Myra Falls	Boliden Westmin Canada Limited	Au, Ag, Cu, Zn	Volcanogenic massive sulphide
PL	Finlay Minerals	Cu, Au	Porphyry
[illegible]	Teck Cominco Metals Ltd	Cu	Vein mesothermal
Pine (Toodoggone)	Stealth Minerals Ltd	Cu, Au, Ag	Porphyry/skarn
[illegible]	CSS Exploration	Au, Ag	Volcanogenic massive sulphide
Rainbow	Abacus Minerals Corporation	Cu, Au	Porphyry
Remac	Redhawk Resources Inc	Zn	Sedimentary exhalative
Sadim	[illegible] Ventures Inc	Cu, Au	Vein mesothermal
SIB	Heritage Explorations Ltd	Au, Ag	Volcanogenic massive sulphide
Sustut	Doublestar Resources Ltd	Cu	[illegible] copper
Table Mtn	Cusac Gold Mines Ltd	Au, Ag	Vein mesothermal
Tas	Navasota Resources Ltd	Au, Cu	Vein mesothermal
Thorn	Rimfire Minerals Corporation	Cu, Au, Ag	Vein mesothermal
Tulsequah Chief	Redcorp Ventures Ltd	Cu, Pb, Zn, Au, Ag	Volcanogenic massive sulphide
Turnagain River	Canadian Metals Exploration Ltd	Ni, Co, Cu	Magmatic PGE
INDUSTRIAL MINERAL PROJECTS			
Black Crystal	Crystal Graphite Corporation	Flake graphite	Industrial mineral deposit
Eagle Rock	Eagle Rock Materials Ltd	Crushed granite	Crushed granite
Elkhorn	Westroc Inc	Gypsum	Industrial mineral deposit
Fir	Commerce Res	Ta, Nb	Carbonatite
Spuzzum	Huckleberry Stone	Dimension stone	Industrial mineral deposit
COAL PROJECTS			
Burnt River	Western Canadian Coal Corp	Coal	NE coal basin
Coal Mountain	Fording Coal Ltd	Coal	SE coal basin
Fording River	Fording Coal Ltd	Coal	SE coal basin
Greenhills	Fording Coal Ltd	Coal	SE coal basin
Klappan	Fortune Minerals Limited	Coal	Anthracite coal
Line Creek	Luscar Ltd - Line Creek	Coal	SE coal basin
Wolverine	Western Canadian Coal Corp	Coal	NE coal basin

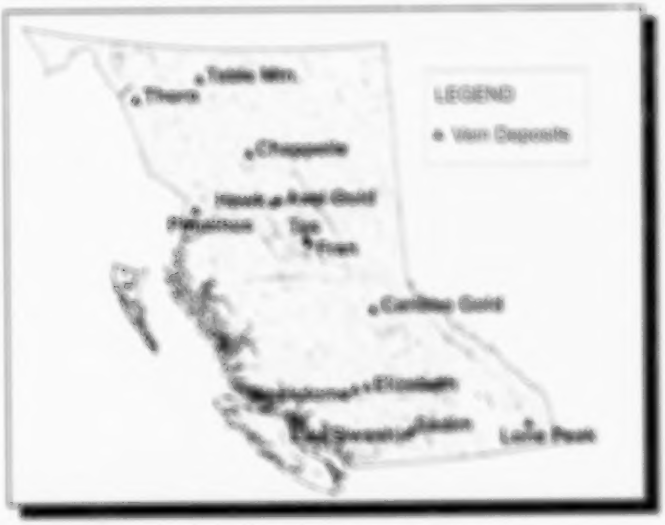
Source: British Columbia Ministry of Energy and Mines.
Note: The project list was developed from publicly available data and from company contacts, up to October 1, 2002.
Ag Silver; Au Gold; Co Cobalt; Cu Copper; Mg Magnesium; Mo Molybdenum; Nb Niobium; Ni Nickel; Pb Lead; Pd Palladium; PGE Platinum group elements; Pt Platinum; Sb Antimony; Ta Tantalum; Zn Zinc.

Figure 31a
Metal Exploration Projects, Including Massive Sulphide, Porphyry and Other Non-Vein Deposits, in British Columbia, 2002 and 2003


LEGEND
● Massive Sulphide
● Porphyry
● Other Non-Vein Metal Projects
Tulsequah
Turnagain River
Kemess North
Pit
Toodoggone
Sustut
Sib
Adam
Lorraine-Jajay
Lustdust
Wardrop
Frank Creek
Ace
Lac La Hache
Rainbow
Afton/Ajax
Logan Lake
Elk
Gold Creek
Myra Falls
Tulameen

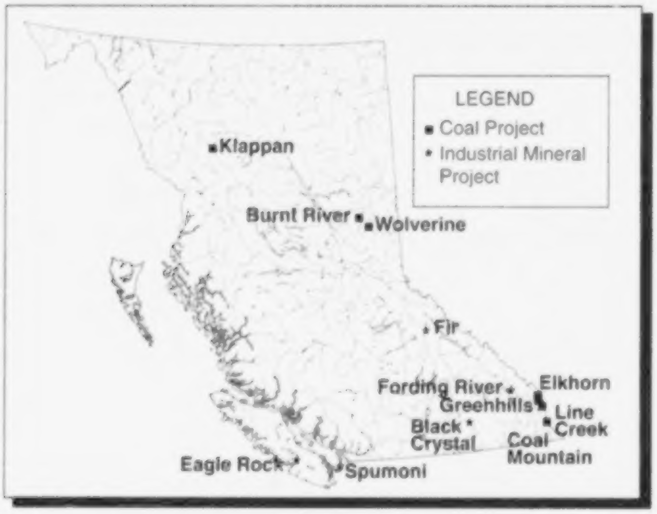
Source: British Columbia Ministry of Energy and Mines.
Note: The project list was developed from publicly available data and from company contacts, up to October 1, 2002.

Figure 31b
Metal Exploration Projects in Vein Deposits in British Columbia, 2002 and 2003


LEGEND
● Vein Deposits
Table Mtn.
Thorn
Chappelle
Hawk
Tan
Fran
Cariboo Gold
Elizabeth
Lode Peak

Source: British Columbia Ministry of Energy and Mines.
Note: The project list was developed from publicly available data and from company contacts, up to October 1, 2002.

Figure 31c
Coal and Industrial Mineral Exploration Projects in British Columbia, 2002 and 2003


LEGEND
■ Coal Project
• Industrial Mineral Project
Klappan
Burnt River
Wolverine
Fir
Fording River
Elkhorn
Greenhills
Line Creek
Black Crystal
Coal Mountain
Eagle Rock
Spumoni

Source: British Columbia Ministry of Energy and Mines.
Note: The project list was developed from publicly available data and from company contacts, up to October 1, 2002.

Conclusions and Future Outlook

With over 12 000 documented and highly diversified mineral occurrences spread throughout nearly one million square kilometres of Cordilleran terranes, British Columbia is well positioned to sustain a healthy mineral sector over the longer term.

The province's government is pro-active in expanding exploration, development and mining operations and has already enacted many changes. The administration is working on additional legislation and jurisdictional changes to foster a business climate that is strongly supportive of growth in mineral exploration and subsequent mining developments and operations.

Currently, the war on terrorism and the decline in the world's economy have created uncertainties in mineral commodity prices and the predictability of future exploration expenditures. Nevertheless, the province's strong mineral endowment and government changes, such as initiating super flow-through shares, which significantly reduce the effective cost of exploration, position British Columbia well for attracting substantial exploration spending as circumstances permit.

2.11 YUKON[12]

2002 Overview

Mineral exploration continues to suffer from the effects of low commodity prices and the extreme difficulty of companies to raise venture capital on the stock markets. Despite these adverse conditions many companies continued to explore Yukon for a wide range of deposit types and commodities. Several new discoveries of significant gold and base-metal occurrences were made in 2002. The number and size of drilling programs decreased slightly from 2001. This is reflected in the $7.2 million NRCan estimate of exploration expenditures for 2002, a small decrease from the $7.8 million spent in 2001.

Claim staking has been robust in 2002 with 2925 claims staked to the end of October, a significant increase over the 1702 claims staked in 2001. Claim staking will eclipse the 3000 mark in 2002 with the late-season staking of prospective emerald targets near the Regal Ridge emerald discovery and geophysical targets similar to the Lucky Joe copper-gold occurrence near Dawson City. Claims in good standing dropped to 43 273 as of October 31, 2002, from 48 982 at the beginning of the year.

A total of 10 209 m of diamond drilling and 994 m of reverse circulation drilling was conducted in 2002 on 14 projects, a slight decrease from the 12 884 m of diamond drilling conducted in 2001.

Mines and Mine Development

Production from the Brewery Creek gold mine declined significantly, triggering Viceroy Resource Corporation to begin its detoxification and heap stabilization program in the second quarter of 2002. The company also continued with significant reclamation and revegetation of pits, dumps and mine site roads. In recognition of its work, the company received the 2002 Robert E. Leckie Award for outstanding reclamation practices. Approximately 2 Mt of capacity remain on the heap leach pad, and Viceroy has been actively evaluating areas near the mine for additional reserves. Remaining resources at the mine site could also be placed on the pad with a sufficient rise in the price of gold.

Mine development expenditures were incurred at the Minto copper-gold-silver deposit of Minto Exploration and by A.M.T. Canada at the Keno Hill silver mine.

The Minto project is currently on hold due to low copper prices. The project, located 240 km northwest of Whitehorse, is being developed as a conventional open-pit mine and milling operation. The in-situ geological reserve for the deposit, above a cut-off grade of 0.50% copper, is 8.818 Mt with grades of 1.73% copper, 0.48 g/t gold (0.014 oz/ton) and 7.5 g/t silver (0.22 oz/ton). This reserve contains 179 million kg (336 million lb) of copper, 4.37 million g (140 500 oz) of gold and 67.68 million g (2.176 million oz) of silver. The ore that will be mined as per the current mine design is 6.51 Mt with grades of 2.13% copper, 0.62 g/t gold (0.018 oz/ton) and 9.3 g/t silver (0.27 oz/ton) with an overall stripping ratio of 4.9:1.0. Minto Exploration incurred minor expenditures in road and site maintenance at the project in 2002 and conducted geological mapping and sampling outside the deposit area.

A.M.T. Canada Inc continued to maintain the historic Elsa properties at the Keno Hill silver mine in central Yukon. The company is planning on using proprietary technology to reprocess tailings at the mine site. The mine has produced over 200 million oz of silver at a historic camp grade of 1370 g/t silver (40 oz/ton silver) from vein deposits within the Mississippian Keno Hill Quartzite.

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[12] The Yukon review of activities was prepared by Mike Burke. For more information, the reader is invited to contact Mr. Burke by telephone at (867) 667-3202 or by e-mail at burkem@inac.gc.ca.

A.M.T. Canada also proposes to restart underground mining where proven and probable underground reserves at the property are 415 000 t grading 1145 g/t silver, 7.5% lead and 5.6% zinc.

The Cantung mine of North American Tungsten Corporation entered into commercial production in 2002. Yukon companies supply the bulk of the supplies and services to the mine, which is accessed through Yukon but is located in the Northwest Territories. The mine also provides high-quality employment for many Yukoners.

Placer Mining Industry

Placer mining in Yukon continued to be an important industry in 2002. A total of 115 mines were operating with approximately 400 people directly employed in the industry. This represents a 7% decrease in the number of operating mines from the 2001 mining season and an 18% decrease over the last two years.

Total placer gold production for 2002 is estimated to be 67 000 crude oz worth $25.8 million compared to 70 819 crude oz in 2001, which represents a 6.1% decrease. Since 1999, placer gold production has dropped 25% to its lowest level since 1979. However, due to a steady rise in the world market price of gold throughout 2002, the drop in gold production was offset considerably by an increase in value. The total dollar value of Yukon placer gold produced in 2002 was approximately $26 million, up slightly from the $23 million generated in 2001. This, combined with an overall decrease in fuel prices from 2001, resulted in a somewhat more profitable year for many Yukon placer miners.

Exploration

Exploration in Yukon is typically divided equally between the search for base and precious metals with slight variations from year to year. In 2002, approximately 60% of all exploration was directed towards the search for precious metals, mainly gold. The bulk of exploration was conducted by junior mining companies and prospectors, which accounted for 90% of total Yukon exploration expenditures. Companies continued to be faced with the inability to quickly raise funds to achieve exploration success. A return to healthy exploration levels in Yukon will continue to be hampered by the lack of investment in the junior mining sector. Despite this, several significant discoveries were made in 2002, mainly by prospecting but more significantly in drill holes. A change may be in the air, as True North Gems had no difficulty in raising funds for continued exploration on the Regal Ridge emerald property. The company successfully completed its Initial Public Offering in late November to raise $1.23 million and captured the attention of the market and other junior mining companies.

New gold discoveries include an intrusive-hosted gold system intersected by drilling at ASC Industries' Ice property; sediment-hosted intrusive-related gold mineralization in drill core not previously analyzed for gold at Expatriate Resources' Lynx Creek project; Klad Enterprises' extensive new intrusive-related gold systems on the Cynthia and Myschka claims; Atac Resources' high-grade gold-copper skarn intersected in drilling on their Arn property; and an extensive gold- and copper-mineralized quartz-carbonate vein associated with an Algoma-type iron formation on Shawn Ryans' Shell Creek property.

Base-metal discoveries include a regionally extensive copper-gold-mineralized horizon on the Lucky Joe property of Copper Ridge Exploration; a high-grade zinc-lead deposit in a carbonate-quartz breccia drilled by Noranda on the Andrew property of Ron Berdahl; a new sedimentary-exhalative system intersected in drilling on Manson Creek Resources' Tanner project and volcanogenic massive sulphide (VMS) mineralization on its JRS claims; and a new VMS occurrence on the Box claims of Expatriate Resources in the Finlayson Lake district. True North Gems announced the discovery of additional areas of emerald mineralization on its Regal Ridge property.

Yukon Government

Yukon Mineral Exploration Tax Credit

The Yukon government supports the industry through the Yukon Mineral Exploration Tax Credit, which provides a 25% tax refund on exploration expenditures for eligible individuals and companies. The tax credit has been extended for an additional year so it is now in effect until March 31, 2004.

Yukon Mining Incentives Program

The Yukon Mining Incentives Program (YMIP) received 99 applications by this year's deadline of March 1. A total of $982 000 was offered to 62 successful applicants. Nine of these programs were approved under the Grass-roots and Grubstake modules, 36 proposals were part of the Target Evaluation module, and 17 applicants were approved under the newly added Focused Regional module. The function of the program is to provide a portion of the risk capital required to locate and explore for mineral deposits in Yukon and is comprised of the following four modules:

1. Grass-roots - Prospecting: Qualified prospectors may apply for a contribution of up to $10 000 per year to cover basic operating expenses while searching for new mineral occurrences in the Yukon (100% of approved expenses are reimbursed).

2. Grass-roots - Grubstake: Companies or individuals providing prospectors with a grubstake (basic operating expenses while searching for new mineral discoveries in Yukon) may apply for a contribution of up to $10 000 per prospector per year (75% of approved expenses are reimbursed).

3. Focused - Regional: Individuals, partnerships or junior companies undertaking basic exploration work directed at appraising the potential of an underexplored area may apply for a contribution of up to $15 000 per year (75% of approved expenses are reimbursed).

4. Target Evaluation: Individuals, partnerships or junior companies undertaking basic exploration work directed at appraising the potential of an unevaluated occurrence or target may apply for a contribution of up to $20 000 per year. The intent of this funding is to allow prospectors to evaluate new occurrences following discovery and to prepare them for option or sale (50% of approved expenses are reimbursed).

Devolution Transfer Agreement and Land Claims Agreements

A long-awaited development that will affect Yukon's mining industry is the Devolution Transfer Agreement. Devolution is the transfer of the federal government's current responsibilities for managing most of Yukon's natural resources to the Government of Yukon. The effective date of devolution is April 1, 2003.

As of October 2002, eight of fourteen Yukon First Nations had settled their land claims while four of the remaining six First Nations had a Memorandum of Understanding with the Government of Canada and Yukon that negotiations are complete. After a legal and technical review, these First Nations are anticipated to ratify their claims by April 1, 2003.

2.12 NORTHWEST TERRITORIES[13]

Introduction

The Northwest Territories constitutes 13.48% of Canada's total landmass and its geological record spans billions of years. As such, the territory is richly mineralized, hosting a wide variety of commodity types. For many years, precious and base-metal mines formed the mainstay of the territories' mining industry. However, the industry is now centred on the emerging diamond mines, which are set to dominate the territories' economy for many years to come.

On April 1, 1999, the territory of Nunavut came into existence, along with the new Northwest Territories. The move removed the Polaris and Nanisivik base-metal mines and the Lupin gold mine from the Northwest Territories. Ekati, Canada's first diamond mine, reached full production during the same year.

Mineral Production Summary

The total value of metal and diamond shipments from the Northwest Territories increased to $901 million in 2001 from $685 million in 2000. The rise can be ascribed to an increase in diamond production (3.7 million versus 2.5 million ct, respectively), partially offset by a decrease in diamond prices. The value of gold shipments remained relatively static at around $55 million. A small amount of silver was also produced.

Diamond shipments accounted for 94% of the total value of metal and nonmetal production in the Northwest Territories in 2001, with gold making up most of the remainder. The territory accounted for 100% of Canadian diamond production and around 3% of gold production during the same period. The CanTung tungsten mine was re-opened in 2002.

Producing Mines

GIANT AND CON GOLD MINES

The Con mine began operating in 1938 and has produced 5.5 million oz of gold to date. The Giant mine was brought into production in 1948 and has produced over 7 million oz of gold. Both are mature mines nearing the end of their lives.

Operations at the Con mine were suspended due to a labour dispute from May 1998 to April 1999. Mining resumed in July 1999 under a five-year plan. In December 1999, Miramar Giant Mine Ltd. was formed as a subsidiary of Miramar Mining Corporation to acquire the assets of the Giant mine from the Department of Indian Affairs and Northern Development (DIAND). Miramar calculated that the acquisition would allow the company to boost production at the combined operations to around 130 000 oz/y while reducing cash operating costs to under US$260/oz. In December 1999, the Con autoclave was successfully recommissioned to process refractory ore concentrates. By mid-February 2000, the autoclave was consistently processing 500 tons/day of refractory ore from both the Con and Giant mines. Production statistics for the Con mine are shown in **Table 19**.

Miramar has been able to reduce cash operating costs at Con through increases in production together with cost reduction measures. Approximately 82 000 tons of ore were mined during the second quarter of 2002, with production from Giant accounting for 20% of the total. Giant's contribution represents a substantial proportion of the total and the mine has therefore played an integral role in lowering operating costs at Con. **Table 20** lists the reserve estimates for the Con and Giant mines as at December 31, 2001.

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[13] This review was prepared by the Minerals, Oil and Gas Division of the Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories. For more information, the reader is invited to contact Christy Campbell by telephone at (867) 920-3345 or by e-mail at christy_campbell@gov.nt.ca.

Miramar has accelerated the treatment of arsenic wastes at Con. Just over 8300 t of waste material were treated during 2001, leaving 10 900 t to be treated. Miramar expects all of the Con arsenic wastes to have been processed by mid-2003.

On June 22, 2001, Miramar gave notice that it would return the Giant mine property to DIAND on December 14, 2001. Subsequently, the company reached an agreement with DIAND to extend operations at Giant until late 2002. DIAND has agreed to cover the costs associated with environmental compliance and holding that were previously the responsibility of Miramar Giant. These costs total some $300 000 per month.

TABLE 19. PRODUCTION STATISTICS FOR THE CON MINE, NORTHWEST TERRITORIES, 1997-2002

	1997	1998	1999	2000	2001	Q1 2002	Q2 2002	Q3 (e) 2002
Gold production (oz)	94 410	(a) 23 477	(b) 38 678	(c) 121 874	129 607	31 749	25 791	37 000
Operating costs ($US/oz)	351	343	272	264	256	240	197	233

Source: Northwest Territories Department of Resources, Wildlife and Economic Development, based on company information.
(e) Estimated.
(a) For the period from January 1 to May 13, 1998. Operations were suspended due to a labour dispute from May 1998 to April 1999.
(b) For the period from July 1 to December 31, 1999. (c) Output from the Giant mine included from year 2000 onwards.

TABLE 20. ESTIMATED RESERVES(1) FOR THE CON AND GIANT MINES, NORTHWEST TERRITORIES, AS OF DECEMBER 31, 2001

	Tonnage	Grade	Quantity of Gold	
	(t)	(g/t)	(kg)	(oz)
Con	860 000	11.79	10 195	324 000
Giant	94 000	11.95	1 152	36 000
Total	954 000	11.89	11 347	360 000

Source: Northwest Territories Department of Resources, Wildlife and Economic Development, based on company information.
(1) The reserves estimates are based on a US$280/oz gold price.

EKATI^{TM} DIAMOND MINE

The Ekati diamond mine was opened on October 14, 1998, in the sub-Arctic barren lands of the Northwest Territories, 300 km northeast of the city of Yellowknife. Some 136 kimberlite pipes have been identified on the property and 20 of these have been bulk sampled. Of the 20 pipes, 8 are in the current mine plan. In excess of 70 Mt of ore, and approximately 508 Mt of waste rock, are scheduled to be mined over the life of the project. Ore grades are in the order of 1 ct/t (1 ct equals 0.2 g). Seven of the eight pipes in the mine plan will initially be mined by open pit. The Panda and Koala pipes will subsequently be exploited via underground methods because of the higher value of their ore. The Koala North pipe will be exploited by underground methods only.

The ore is currently being processed at a rate of 9000 t/d, but it is planned to increase this to 18 000 t/d from 2007 onwards. The mine life is currently pegged at 17 years.

The Ekati mine produces around 4 million carats (Mct) of predominantly gem and industrial-quality diamonds a year, about 4% of current global production by weight and 6% by value. Production statistics for Ekati are shown in **Table 21**.

DIAVIK DIAMOND MINE

Permitting and licensing approvals were obtained from the federal government in late 1999 for the Diavik diamond mine (60% Diavik Diamond Mines Inc., 40% Aber Diamond Mines Ltd.). Construction of the mine, at a cost of $1.3 billion, is currently under way. During the 2001 winter road season, 4089 truckloads of fuel, construction materials and equipment were hauled to the project site.

Diavik is scheduled to commence production in April 2003. Reserves are estimated at 25.6 Mt grading 4.15 ct/t, making the deposit one of the richest in the world. Some 63 kimberlite pipes have been identified on the property. A 20-year mine life is envisaged with diamond production averaging 5.4 Mct/y. Diamond prices are expected to be US$63.74/ct.

CANTUNG TUNGSTEN MINE

North American Tungsten (NAT) owns both the CanTung mine and the MacTung deposit, located in the Deh Cho and Sahtu regions, respectively. Both are situated on the Northwest Territories/Yukon border and contain approximately 15% of the Western World's known tungsten resources. The CanTung mine operated from 1962 to 1986; it was subsequently closed due to low commodity prices and placed on care and maintenance. The MacTung deposit is undeveloped at this time but contains substantial resources of tungsten.

CanTung resumed operations in January 2002 and production statistics for the first semester are presented in **Table 22**.

NAT applied to the Mackenzie Valley Land and Water Board (MVLWB) in February 2002 for a renewal of its water licence, due to expire in September 2002. MVLWB decided that a new water licence was required, subject to a full environmental assessment. NAT has asked for a judicial review of this decision.

TABLE 21. PRODUCTION STATISTICS FOR THE EKATI DIAMOND MINE, NORTHWEST TERRITORIES, 1998-2002

Year	Diamond Production
	(000 ct)
1998	278
1999	2 496
2000	2 533
2001	3 691
2002 (e)	4 086

Source: Northwest Territories Department of Resources, Wildlife and Economic Development, based on company information.
(e) Estimated.

TABLE 22. PRODUCTION STATISTICS FOR THE CANTUNG TUNGSTEN MINE, NORTHWEST TERRITORIES, FIRST HALF OF 2002

	First Quarter 2002	Second Quarter 2002
MTU (a)	34 700	. .
$/MTU	90 698	(b) 75.47

Source: Northwest Territories Department of Resources, Wildlife and Economic Development, based on company information.
. . Not available.
(a) 1 MTU = 10 kg of tungsten concentrate.
(b) Revenues were $81.31/MTU.

2002 Exploration Summary

Exploration expenditures in the Northwest Territories are expected to total \$37.7 million in 2002, a significant drop from the \$86.6 million spent in 2001. Furthermore, a large proportion of this exploration money is being spent on deposit appraisal rather than grass-roots exploration–\$16.4 million versus \$21.3 million, respectively. (Deposit appraisal includes engineering studies, environmental studies and additional drilling to firm up on grade and tonnage estimates of known mineral deposits, while grass-roots exploration involves the discovery of new mineral deposits.)

Exploration expenditures for Canada as a whole are expected to total \$501.1 million in 2002. Expenditures in the Northwest Territories therefore account for around 7.5% of the Canadian total.

The more advanced mineral exploration and development projects in the Northwest Territories are detailed in **Table 23**.

Work was carried out on 45 exploration projects in the Northwest Territories in 2001. Of this total, 22 projects were focussed on diamonds and 23 on various metals (i.e., precious metals, base and steel industry metals and industrial metals).

TABLE 23. ADVANCED MINERAL EXPLORATION AND DEVELOPMENT PROJECTS IN THE NORTHWEST TERRITORIES, 2002

	Commodity	Owner	Tonnage (Mt)	Grade
Diavik (a)	Diamonds	Diavik 60% Aber 40%	25.60	4.15 ct/t diamonds
Snap Lake	Diamonds	De Beers 100%	24.40	1.51 ct/t diamonds
Kennady Lake	Diamonds	De Beers 51% Mountain Province 44.1% Camphor 4.9%	29.06	1.51 ct/t diamonds
Damoti Lake	Gold	Standard Mining 100%	0.41	12.91 g/t gold
Discovery Mine/Nicholas Lake	Gold	Tyhee Development 100%	(b) 1.04	13.99 g/t gold
NICO	Cobalt, gold, bismuth, copper	Fortune Minerals 80% Private company 20%	35.40	0.11% cobalt 0.6 g/t gold 0.13% bismuth
Prairie Creek	Zinc, lead, silver	Canadian Zinc 100%	11.80	12.5% zinc 10.1% lead 161 g/t silver
Howard's Pass	Zinc, lead	Placer Dome 51% Cygnus Minerals 49%	113.40	5.4% zinc 2.1% lead
Lake Zone, Thor Lake	Tantalum	Rare Metal Alloys 100%	65.00	0.03% Ta_2O 0.4% Nb_2O_5
"M" Zone, Hart Property	Zinc, lead silver, gold	Tri-Star Syndicate 51% Solid Resources 49%	1.20	5.10% zinc 2.2% lead 337 g/t silver 0.6 g/t gold

Source: Northwest Territories Department of Resources, Wildlife and Economic Development.
(a) The Diavik mine is under construction. (b) Indicated resources only.

Diamonds

Diamond exploration highlights and developments for 2002 are as follows:

- De Beers Canada's Snap Lake diamond mine is now expected to commence production a year later than planned due to delays in the permitting process. In August 2002, De Beers announced it would delay the start of production from Snap Lake to late 2005.
- De Beers Canada, in a joint venture with Mountain Province Diamonds, recovered further bulk samples from the Hearne and 5034 pipes at Kennady Lake. For the 5034 pipe, a total of 1215 ct were recovered from 836 t of kimberlite with the three largest diamonds weighing 7.0, 6.6 and 5.9 ct, respectively. A significantly larger number of diamonds greater than 1 ct were recovered in this bulk sample compared to the samples taken in 1999 and 2001 (70 compared to 42 and 34, respectively). The sample results for the Hearne pipe are awaited. Drilling at MZ Lake, 20 km northwest of Kennady Lake, resulted in the discovery of four kimberlite sills, three of which were diamondiferous. The thickest intersection drilled was 3.2 m at a depth of 27 m. A total of 50 microdiamonds were recovered from 56 kg of kimberlite.
- A drilling program on the Afridi Lake property of Mantle Minerals intersected 62 m of kimberlite while testing a geophysical electromagnetic anomaly immediately west of the known DA-2 kimberlite. The property, located 80 km southeast of the Ekati diamond mine, is under option to Shear Minerals, Dasher Energy and International Samuel Exploration. Further exploration drilling is under way.
- SouthernEra Resources re-tested the Sue and Sputnik kimberlite pipes at the Yamba Lake project, 40 km north of the Ekati mine. The Sue kimberlite pipe has a surface expression estimated at 150 m by 100 m. A 226.7-kg kimberlite sample from the pipe yielded 30 micros and 18 macros, including 11 stones exceeding 0.5 mm in two dimensions.
- Archon commenced testing some 19 geophysical pipe-like targets in the WO block identified by BHP. The WO claim block lies directly south of the Diavik diamond mine. The company intercepted 38.7 m of kimberlite while drilling a lake-covered gravity low. The surface expression of the gravity low is 3.1 ha. The WO claims are held 55% by DHK Diamonds, 20% by Archon, 15% by Aber and 10% by SouthernEra.
- Diamondex Resources is set to begin a 1600-m drilling program that will test up to eight targets on its wholly owned Czar, Hilltop and Bear Head properties.
- Tahera, together with joint-venture partner BHP Billiton, is exploring the ICE claims/Ranch Lake kimberlite north of the Ekati diamond mine. The Ranch Lake kimberlite was sampled in the spring of 2002. A total of 266 diamonds were recovered, of which 46 were greater than 0.425 mm in diameter. BHP Billiton plans to continue its assessment of the Ranch Lake pipe.

Precious Metals

Gold exploration highlights and developments for 2002 are as follows:

- Canadian Zinc has recently signed a Letter of Intent to enter into an Option Agreement with Standard Mining, a wholly owned subsidiary of Doublestar Resources, to acquire 50% of the Damoti Lake gold project. Damoti Lake is located 200 km north of Yellowknife, 14 km south of the past-producing Colomac gold mine. The Option Agreement contemplates Canadian Zinc expending $2.4 million on the property over four years to earn its 50% position and also making annual lease payments in cash and stock.

- Tyhee is exploring its Nicholas Lake and Discovery mine properties, located 90 km north of Yellowknife. The two properties are known to contain 690 000 oz of gold. Tyhee has budgeted $800 000 on a 21-hole drill program for 2002. Drill results received to date confirm that the gold mineralization continues for at least 300 m north of the previously established resource. Intercepts so far include 11.8 g/t gold over 1.5 m, 7.2 g/t gold over 1.5 m, 21.8 g/t gold over 1.5 m, and 6.6 g/t gold over 1.6 m.

Base and Steel Industry Metals

Base and steel industry exploration highlights and developments for 2002 are as follows:

- Exploration has resumed on Canadian Zinc's Prairie Creek lead-zinc project. Five holes, all of which intersected high-grade mineralization, were completed during 2001. The company recently received a permit for a 60-hole drill program designed to infill and extend the existing known resource. In addition, permits for the operation of a pilot plant and the driving of a decline have cleared the Mackenzie Valley Environmental Impact Review Board and are now in the hands of federal Minister Nault (DIAND).

- Fortune Minerals, owner of the NICO cobalt-gold-bismuth project, carried out metallurgical test work to improve metal recoveries. Recoveries are now estimated at 83% for cobalt, 42% for bismuth, and 50-70% for gold.

- Solid Resources drilled three holes in the Hart property west of the Sunrise deposit. The first hole tested the northern extension of the "M" zone, the second hole tested the so-called "C" zone, and the final hole tested an area north of the "M" zone. Results are not available.

Industrial Metals

Industrial metal exploration highlights and developments for 2002 are as follows:

- Navigator Exploration and Highwood Resources carried out further metallurgical test work on the tantalum-niobium-yttrium-zirconium and rare earth element-bearing Lake zone, situated at Thor Lake, 100 km southeast of Yellowknife. The Lake zone has a resource of 65 Mt grading 0.03% tantalum pentoxide and 0.4% niobium pentoxide. Navigator may acquire a 51% interest in the property from Highwood by making cash payments and exploration expenditures totaling $1.5 million over four years.

2002 Government Programs (C.S. Lord Northern Geoscience Centre)

DIAND's Northwest Territories Geology Division and the Government of the Northwest Territories' Department of Resources, Wildlife and Economic Development began merging their geoscience programs in 1997. In 2001, staff from both governments involved in the collection of new geoscience data moved into shared facilities, the C.S. Lord Northern Geoscience Centre, located in Yellowknife. The Centre is supported by DIAND, the Government of the Northwest Territories and the Geological Survey of Canada (GSC).

The MVT Project

This project is focused on carbonate-hosted lead-zinc Mississippi Valley Type (MVT) occurrences in northern Alberta and the southern Northwest Territories. The MVT project originated from a geoscience sub-agreement in the 1999 Alberta-Northwest Territories Memorandum of Understanding for Co-operation and Development. This project is being undertaken as a partnership between the C.S. Lord Northern Geoscience Centre, the Alberta Geological Survey and the Calgary office of the GSC. Funding comes from the three agencies involved and from the federal Targeted Geoscience Initiative.

The project aims to delineate and describe the origin, distribution and potential for carbonate-hosted lead-zinc deposits in the northern Western Canadian Sedimentary Basin. The study area includes Teck Cominco's former Pine Point mine, which produced 83 Mt of ore from a number of orebodies between 1964 and 1987. The proposed project will examine the host lithology, associated structures, and geochemical signatures of the lead-zinc deposits to address the source and pathways of the mineralizing fluid and the timing of ore deposition for the purpose of advancing current exploration models. A manuscript for Current Research is being prepared. In addition, an external paper on the results of a hyperspectral study of Pine Point ore with collaborators at the University of Alberta is "in press" and a compilation of drill core from Western Minerals' property west of Pine Point is under way.

Additional subsurface analysis was provided through the integration of petroleum exploration well and seismic data between Island River and Hay River.

Walmsley Lake Project

A three-year project to conduct integrated bedrock mapping and mineral showings compilation began in the Walmsley Lake area of the southeastern Slave Province in 2000. The project is a collaboration between the C.S. Lord Northern Geoscience Centre, the GSC and university researchers. Funding for the project comes from the partners and from the federal Targeted Geoscience Initiative. Bedrock and surficial geology mapping at a scale of 1:100 000 will be integrated with petrogenetic studies of mantle- and crustal-derived plutonic rocks (undertaken by the GSC). The petrogenetic studies include isotopic analyses to identify the eastern limit of the Meso-Archean basement at depth.

The Walmsley Lake region is an area of active diamond exploration with lesser-known potential for gold and base-metal deposits. Outputs from the project will improve the framework for mineral and diamond exploration in this region by generating new geological maps and geoscientific understanding of the area. Two Masters of Science thesis projects are being supported through the Walmsley Lake project. The project received $190 000 in funding from the federal Targeted Geoscience Initiative during fiscal year 2000/01. Other funding has come from the C.S. Lord Northern Geoscience Centre and from the GSC in Ottawa. A manuscript for the GSC's Current Research is in preparation and the final digital compilation is under way with a targeted release by spring 2003.

Snare River Mapping Project

The Snare River mapping project is a bedrock mapping project in the southwestern Slave Province that is focused on upgrading the existing bedrock geology base and integrating geochemical, pressure-temperature (P-T), geochronological and isotope studies. Bedrock mapping in the Snare River area was completed and work has begun on the final digital compilation. Maps (1:50 000 scale) of areas covered this summer will be released over the winter, and a digital atlas of all data is planned for spring/summer 2003.

Resource Assessments

DIAND has provided funding for two term positions to conduct resource assessments under the Northwest Territories Protected Areas Strategy (PAS), one for minerals and one for petroleum. The positions run from April 2001 to March 2004. Both positions have been filled.

The PAS geologists will coordinate mineral and petroleum resource assessments of candidate protected areas under Step 5 of the Northwest Territories PAS. In addition, these two geologists will provide technical support and mineral/energy resource-related information to communities and organizations that wish to propose potential protected areas.

Mineral Occurrences Database

The NORMIN.DB database of mineral showings and geological/exploration references and web site were transferred to the C.S. Lord Northern Geoscience Centre over the summer of 2002. The populating of NORMIN references with spatial metadata was in progress during the year. NORMIN will be the Northwest Territories/Nunavut node of the Canadian Geoscience Knowledge Network data catalogue, a web portal providing query capability for publications and datasets listed in databases distributed across Canada.

Databases to Support Diamondiferous Kimberlite Exploration

The second release of KIDD (Kimberlite Indicator and Diamond Database) was published in March 2001. It contains kimberlite indicator mineral picking results from 110 000 samples of glacial till collected over diamond exploration properties in the Slave Province.

The KIMC (Kimberlite Indicator Mineral Chemistry) dataset was published at the same time; it contains electron microprobe results for various mineral grains selected from till samples. Like KIDD, it is a compilation of data submitted to DIAND by the mineral exploration industry.

SMAC (Slave Magnetics Compilation) was published in November 2001. It is a compilation of georeferenced images of airborne total field magnetic data derived from industry submissions covering a large portion of the Slave Province. Where raw data are in the public domain, images were created by processing in-house; where only paper maps were available, these were scanned and georeferenced.

The KANDD (Kimberlite Anomaly Drill Hole Database) was published in the fall of 2001. This compilation contains the locations of all holes drilled to test for kimberlite, including those that intersected kimberlite, header data and scanned drill logs for each hole, and the file number of the relevant assessment report.

2.13 NUNAVUT[14]

Territory of Nunavut

In 1993, the largest Aboriginal land settlement in Canadian history was concluded through the Nunavut Land Claims Agreement (NLCA). The NLCA provided for the formation of the new territory of Nunavut on April 1, 1999, as well as providing many other rights to Inuit. Nunavut, which covers 1 994 000 km^2, comprises the eastern and northern portions of land previously referred to as the Keewatin and Franklin districts of the Northwest Territories. Nunavut's population is approximately 27 000, 85% of which is of Inuit origin. A total of 27 communities are home to anywhere from 50 to 6000 people. Most communities offer a range of services (visit the Canada-Nunavut Community Business Service Centre web site at www.cbsc.org/nunavut), including regular scheduled air service. Several offer specific mining and exploration-related services and are home to independent prospectors and others experienced in mineral exploration and mining.

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[14] This overview is a combined effort by the Minerals, Oil and Gas (MOG) Division of the Department of Sustainable Development of the Government of Nunavut, the Nunavut Mineral Resources Section of the Department of Indian Affairs and Northern Development (DIAND), and the Lands and Resources Department of Nunavut Tunngavik Incorporated (NTI). For more information, the reader is invited to contact Bernie MacIsaac by telephone at (867) 975-5914 or by e-mail at bmacisaac@gov.nu.ca.

Land Tenure

In addition to the creation of the new territory, the NLCA gave Inuit fee simple title to 356 000 km^2 of land. There are 944 parcels (16% of Nunavut) of Inuit Owned Lands (IOL) where Inuit hold surface title only (Surface IOL). The Crown retains the mineral rights to these lands. Inuit also hold fee simple title, including mineral rights, to the remaining 150 parcels of IOL (Subsurface IOL), which total 38 000 km^2 and represent approximately 2% of the territory. Surface title to all IOL is held in each region by one of the three Regional Inuit Associations (RIAs) while Inuit subsurface title with respect to Subsurface IOL is held and administered by Nunavut Tunngavik Incorporated (NTI). NTI issues rights to explore and mine through its own mineral tenure regime. Mineral rights (mineral claims or leases) that existed at the time of the signing of the NLCA, known as "grandfathered rights," continue to be administered by the federal Department of Indian Affairs and Northern Development (DIAND) until they terminate or the holder transfers its interests to the NTI regime. For both Surface and Subsurface IOL, access to the land, through a Land Use Licence or Commercial Lease, must be obtained from the appropriate Regional Inuit Association.

DIAND administers mineral rights to the 98% of Nunavut for which the Crown owns these rights through the Canada Mining Regulations (CMR). This includes Surface IOL, for which access to the land must nevertheless be obtained from the RIA as explained above (visit the following web sites for more information: www.polarnet.ca/ntilands/Exploration_App.htm, http://npc.nunavut.ca/eng/index.html, and www.pail.ca/inuorg.htm#qikinu).

Significantly, the NLCA is a final settlement whereby all land claims in Nunavut have been settled with the Inuit of Nunavut, thus providing an unmatched level of land tenure certainty. However, land claims overlapping Hudson Bay and the southernmost Kivalliq are being negotiated with residents of northern Québec and northern Manitoba, respectively. The Government of Nunavut, DIAND, NTI, the Canada-Nunavut Geoscience Office (C-NGO) and other pertinent government divisions and associations are working together to improve the territory's geoscience knowledge base through regional mapping programs, thematic investigations, and geological compilation.

Mineral Tenure

DIAND administers mineral tenure on Crown land in Nunavut. The Nunavut Regional Office experienced a busy year as a result of the upswing in exploration across the territory.

The Mining Recorders' Office received applications to record 3815 claims covering just over nine million acres between January and October of 2002. Two hundred and thirty-two new prospecting permits and five coal exploration licences were issued, most of the permits being part of De Beers' large land package on northern Baffin Island. Staff have had improvements made to the Mineral Exploration Recording System (MINERS).

Nunavut Tunngavik Incorporated (NTI) is the Inuit corporation responsible for overseeing implementation of the NLCA. NTI's mandate includes safeguarding, administering and advancing the rights and benefits of the Inuit of Nunavut to promote their economic, social and cultural well-being through succeeding generations. The Lands and Resources Department of NTI is responsible for the implementation of Inuit responsibilities related to the management of Inuit Owned Lands (IOL), the environment, minerals, oil and gas, and marine areas.

There are two forms of mineral tenure that grant exclusive rights on Subsurface IOL administered by NTI. These are the Inuit Owned Lands Mineral Exploration Agreement (usually referred to as the "Exploration Agreement" or "EA") and the Inuit Owned Lands Mineral Production Lease (referred to as the "Production Lease"). The Exploration Agreement grants a company or individual the exclusive right to explore and prospect for minerals (excluding oil and gas, and specified substances such as construction materials and carving stone) on a portion of Subsurface IOL. This area, referred to as the Exploration Area, is similar in many ways to a mineral claim under the Canada Mining Regulations (CMR).

The Production Lease grants the holder of an Exploration Agreement the right to produce minerals from a portion of the Exploration Area known as the Production Lease Area.

Since 1999, NTI has had in place a system of application that does not require staking when applying for an Exploration Agreement. Rather, the application requires only a description of the Exploration Area based on latitude and longitude. Under the standard terms, successful applicants, upon executing the new Exploration Agreement and submitting the first year's annual fees, will be granted the exclusive rights to explore for minerals in the Exploration Area. In order to gain access to the land, however, the applicant must obtain a surface right issued by the RIA.

NTI currently has 69 active Exploration Agreements with prospectors and exploration and mining companies. These cover more than 11% of the total Subsurface IOL. (In addition, grandfathered claims and leases comprise approximately 2% of all Subsurface IOL.)

In response to the intense interest in diamond exploration in the West Kitikmeot region in 2001 and 2002, NTI requested offers for Exploration Agreements that provided greater benefit to Inuit than the standard agreement. Many applications were received and NTI entered into negotiations with three companies. One agreement has been signed and negotiations with respect to two others are at advanced stages. On the successful conclusion of this process, all of the open Subsurface IOL in the West Kitikmeot region will be subject to agreements with NTI or grandfathered rights under the CMR.

Canada-Nunavut Geoscience Office

The Canada-Nunavut Geoscience Office (C-NGO) is a partnership between the Government of Nunavut, the Geological Survey of Canada and DIAND. During 2002, the CNG-O concluded the field components of its Committee Bay and Central Baffin integrated geoscience projects, as well as its Arctic Island zinc study that focused on base-metal potential in the Polaris mine district. All three of these projects were initiated in 2000 and co-delivered with the Geological Survey of Canada (GSC). Reports on these projects will be published in the GSC's upcoming Current Research (February 2003).

Staff of the C-NGO continued a detailed investigation at Breakwater Resources' Nanisivik mine that focused on the age and stratigraphic and structural controls on zinc-lead-silver mineralization to establish exploration criteria for similar deposits. In collaboration with DIAND and Miramar Mining Corporation, an investigation of the volcanic stratigraphy and structural framework of the Wolverine-Doris corridor, Hope Bay volcanic belt, was undertaken. Similarly, in collaboration with Cumberland Resources, a structural investigation was undertaken at the newly discovered Vault deposit, complementing previous work in the area. Reports of various technical aspects of these investigations will also be published in the GSC's forthcoming (February 2003) Current Research and can be viewed at the following Internet address: www.nrcan.gc.ca/gsc/bookstore/index_e.html.

A new thematic study focusing on potential base metal-bearing carbonate stratigraphy on the Borden Peninsula, along strike to the southeast of the Nanisivik mine, was initiated in 2002. Fieldwork focused on stratigraphy and sedimentology of the Society Cliffs formation, and on the local setting of stratigraphically delimited sulphide showings. Reports of this fieldwork will be published in the GSC's upcoming Current Research (January 2003).

Nunavut Prospectors Program

Thirty-three prospectors Nunavut-wide received funding through the Nunavut Prospectors Program (NPP) in 2002. This very successful program was initiated in 2000 by the Department of Sustainable Development to assist prospectors in evaluating and collecting rock samples in order to stake claims and actively contribute to mineral exploration in Nunavut.

Summary of Mining and Exploration

It is estimated that $61.3 million was spent on exploration in 2001 with projections for 2002 of $67.8 million. Most of this money will have been spent on gold and diamond exploration. Despite being fewer in number, Nunavut's gold projects include several advanced projects with major budgets, whereas the more numerous diamond projects are mostly in their early stages. Consequently, money spent on gold and diamonds is approximately equal. Base-metal exploration accounts for a small proportion of total expenditures.

The winter of 2001/02 saw over 8 million acres acquired by the mining industry in the form of mineral claims, prospecting permits, and exploration agreements. The vast majority of this land was acquired within a 150-km radius of the diamond discoveries reported in 2001 by Ashton Mining of Canada, Kennecott Canada Exploration, and their respective joint-venture partners.

Despite the excitement caused by the staking rush, not all of the new property holders were able to raise exploration capital. Consequently, fieldwork only took place on about half of the land within the North Slave diamond district. That work produced three new kimberlites: Stellaria (at Kikerk Lake), Thrift (at Kim), and Atani (at Rockinghorse). Ashton's follow-up work on the Potentilla and Artemisia kimberlites indicated sub-economic grades, although Potentilla was found to contain commercial-size stones of up to 0.34 ct.

Victoria Island was the site of renewed diamond exploration that culminated with 11 new kimberlite discoveries on the Hadley Bay and Blue Ice properties northwest of Cambridge Bay. Some of these new finds lie on a large structure known as the Galaxy Trend and at least one of this year's discoveries is diamondiferous. The companies active on Victoria have benefited from the fact that the kimberlites are the only magnetic bodies to penetrate the carbonate platform overlying the island; this assisted in selecting drill targets from geophysical surveys and also implies that prospecting can result in new discoveries.

Metal exploration in the Kitikmeot remains healthy with significant drill intersections reported at the Goose Lake and Hope Bay gold projects and at the High Lake base-metal project. Once again, Hope Bay was the largest single project in the territory with expenditures of approximately $13 million.

Miramar has begun permitting the Doris Hinge gold deposit for eventual development, and Nuna Logistics and Kitikmeot Corporation have also begun permitting for the Bathurst Inlet road and port project. In terms of permitting, these projects join Tahera's Jericho diamond project for which a final environmental impact statement is the next step in the process. It is possible that 2003 may see two additional projects begin permitting: Cumberland's Meadowbank gold project and Inmet Mining's Izok Lake base-metal project.

The development of some or all of those projects will be necessary to rejuvenate Nunavut's mining industry, which is down to just one operating mine: Lupin. Both the Polaris and Nanisivik zinc mines have closed their doors and commenced reclamation work. Polaris had exhausted its orebody and Nanisivik proved to be uneconomic in the face of record-low zinc prices.

Not surprisingly, interest in zinc exploration on Baffin Island and the High Arctic has waned, and the commodity of choice now happens to be diamonds. Only BHP Billiton continued to look for zinc this year at its Piling project on central Baffin Island. Further north, Kennecott and Twin Mining were joined on northern Baffin Island by De Beers, which acquired over seven million acres in the form of prospecting permits southeast of the Jackson Inlet discoveries. Stornoway Ventures and Northern Empire Minerals, meanwhile, acquired permits on the Melville Peninsula and began exploring the Aviat North and South properties.

Diamond exploration is even making a reappearance in the Kivalliq, where Shear Minerals and Northern Empire have reported finding kimberlite float in two locations near Rankin Inlet. Coupled with previously known kimberlite, lamprophyre and minette occurrences in the area, it suggests that the Kivalliq may have untapped diamond potential.

Gold and base-metal exploration in the Kivalliq has remained relatively constant. Cumberland has added a sixth deposit, PDF, to its portfolio of gold deposits at the Meadowbank project and is now at a feasibility stage. Starfield Resources has begun infill drilling at the shallower parts of the Ferguson Lake deposit and is also investigating recently discovered platinum-palladium-enriched horizons outside of the massive sulphide body.

Some of the projects mentioned above, as well as other projects, are described further in the following review of exploration activities by administrative region.

Kivalliq Region

The Kivalliq region includes the eastern mainland, Southampton Island, and several smaller islands. The region is underlain primarily by the Archean-Proterozoic Western Churchill geological province. Sedimentary rocks of the Hudson platform are found covering most of the islands. Past-producing mines in the region include the North Rankin Inlet nickel mine.

AMAROK

The Amarok gold property (NDT Ventures Ltd.) is adjacent to the Fox project. The combined property covers a 40-km-long supracrustal package that hosts the gold-mineralized silicate and oxide facies iron formations. Before acquisition of the Amarok ground, NDT's due diligence (2001) over the AVWolf showing defined surface gold mineralization over an area measuring 100 m by 600 m. Recent work on AVWolf includes a detailed airborne magnetic survey (summer 2002) and channel sampling (169 samples of which 59 returned anomalous gold values). Gold values in excess of 1 g/t with a high of 4.12 g/t were noted over widths of 0.5 m to plus 2 m.

FERGUSON LAKE

Starfield Resources' Ferguson Lake property covers 57 304 acres in the Ferguson Lake area. The West zone is the principal deposit receiving exploration attention. As a result of 2001 drilling, Starfield boosted its inferred resource for the property to 51.7 Mt grading 0.92% copper, 0.58% nickel, and 1.44 g/t combined palladium and platinum. This includes a higher-grade resource of 9.3 Mt grading 1.37% copper, 0.87% nickel and 2.06 g/t palladium and platinum. In 2002, Starfield conducted an aggressive drilling campaign. A shallow intersection in the eastern part of the West zone returned values averaging 13.96 g/t platinum and 19.13 g/t palladium over 1.1 m. This high-grade intercept comes from low-sulphide material, approximately 30 m from another intercept that produced grades of 12.89 g/t palladium and 1.38 g/t platinum over 1.04 m. The new "119" zone, situated on the extension of the West zone, is a PGE-rich massive sulphide body that has been drill tested (8000 m) over a length of 400 m. Ongoing drilling of this zone (late 2002) is adding significantly to the understanding of the PGE distribution on the property.

KAZAN

Tri-Origin Exploration is exploring for Olympic Dam-style copper-gold mineralization at the Kazan project where it has completed a 6000-line-km, state-of-the-art combined airborne magnetic and gravimetric survey. Data compilation and final processing of the airborne data were completed in 2002 and the project has now progressed to the drill stage.

MEADOWBANK

In 2002, Cumberland Resources entered into the feasibility stage with its Meadowbank gold project. Six gold deposits have now been defined: Goose Island, Third Portage, North Portage, Vault, Bay

Zone and PDF. The discovery of the Connector zone during the summer of 2002 is significant as it allows Cumberland to consider the economic and environmental viability of a super-size open pit. Economic studies were completed in January 2002 by consulting engineers MRDI Canada. From the five deposits outlined at that time, the project resources stood at 7 775 000 t grading 5.79 g/t gold (measured and indicated) and 10 937 000 t grading 4.44 g/t gold (inferred) for a combined 3 008 000 oz of gold. Utilizing a production rate of 246 000 oz/y, with estimated total cash costs of US$168/oz and 85% of production from open pits, a mine lifespan of 8.3 years was estimated.

A $6.5 million two-phase exploration program was undertaken in the spring and summer of 2002 to boost mineable resources and bring the potential mine project to a 10-year lifespan. The 16 000 m (in 142 drill holes) of diamond drilling performed this year brings the historical total to over 550 drill holes put down on the six deposits. Many highlights came out of the 2002 exploration efforts. The new Connector zone is a near-surface zone with some spectacular high-grade gold. For example, from hole NP02-397, at a depth of 45 m below surface, the drill encountered 44.75 g/t gold over 6.7 m. Included in that interval is a shorter segment of 175.60 g/t gold over 1.46 m. The Connector zone will be an important new consideration in the feasibility study. In October 2002, Cumberland announced that the PDF gold occurrence had been designated a deposit and that it is still open in all directions. Additional work this year includes the completion of environmental baseline studies in preparation for the mine development permitting process. Metallurgical and geotechnical studies that tie into the feasibility analysis continue.

MELIADINE WEST

Although there was no exploration activity on the Meliadine West gold project in 2002, the deposits that make up this property still contain significant gold resources. Majority owner WMC International (56%) has placed its interest in the project for sale, along with all the rest of its global gold holdings. As of early November 2002, no buyer had been identified for the Meliadine West project.

NOOMUT

Placer Dome Inc. entered into a joint-venture agreement with Comaplex Minerals on the Noomut gold project in 2002. Under this agreement, Placer can earn up to a 75% working interest by spending $8 million over a five-year period. Approximately $1 million was spent exploring the 34-claim package during the summer of 2002 for surface geophysics and 2500 m of drilling.

Qikiqtani-Baffin Region

In the Qikiqtani region, both the Polaris and Nanisivik mines closed in 2002. The Nanisivik mine produced 516 544 t of ore at a grade of 10.0% zinc and 42 g/t silver to the end of September 2002. Nanisivik ceased operations on September 30, 2002, due to low metal prices. The Polaris zinc-lead mine of Teck Cominco Limited shut down on September 4, 2002, after exhausting its ore reserves and having produced 2.6 Mt of zinc and 666 000 t of lead concentrates over a 20-year mine life.

At this time, there are no advanced exploration projects in the region. The main focus of grass-roots exploration is diamonds.

BAFFIN ISLAND

In 2000, De Beers Canada Exploration Inc. performed reconnaissance soil sampling on Baffin Island, leading the company to apply for, and receive, 131 prospecting permits covering 8 043 661 acres around Steensby Inlet on northern Baffin Island. The 2002 program consisted primarily of reconnaissance and follow-up till sampling and surficial mapping. An airborne geophysical survey, exploration drilling and detailed follow-up till sampling program are planned for 2003.

JACKSON INLET

Twin Mining Corporation's Jackson Inlet diamond property covers 111 claims (82 640 acres) on the Brodeur Peninsula of Baffin Island. Twin Mining Corporation undertook a large program in 2001, including extensive geophysical surveys. In addition, 17 diamond drill holes, the collection of 87 soil samples, and surficial geological mapping were completed on 10 claims. The work demonstrated that the occurrences were part of a single large kimberlite: the Freightrain. A mini-bulk sample of 228 t of dry kimberlite was excavated from six separate pits on the Freightrain pipe. Results from the bulk sample were encouraging with 46.208 ct (869 diamonds at +0.85 mm) of white, transparent diamonds recovered and 4.376 ct of yellow, amber and pink transparent stones. The largest diamond recovered was 1.557 ct, white, transparent and of gem quality. Twin Mining reports a modelled grade based on the mini-bulk sample of up to 0.5 ct/t. A vertical core drill hole drilled between pits JI-1 and JI-2 indicated that results from the pits are reproducible to depths of 206 m for the Freightrain pipe. Diamond extraction from a 924.72-kg sample from Cargo 1 yielded 180 microdiamonds and 43 macrodiamonds (>0.5 mm in one dimension) and indicates continuity and reproducibility of diamond distribution to a depth of 150 m. During the 2002 field season, Twin Mining continued working on its Jackson Inlet properties. No results were available as of November 1, 2002.

OZ

The Oz series of diamond exploration claims of Kennecott Canada Exploration are found in seven blocks located east-southeast to north-northwest of Nanisivik on the Brodeur Peninsula. During the 2002 field season, Kennecott Canada collected approximately 300 till samples, 25 stream sediment samples and 2 rock samples. The company also conducted a 7000-line-km airborne magnetic survey and ground magnetic surveys on four grids for a total of 25 line km.

PILING

BHP Billiton is exploring two Prospecting Permits and ten NTI Exploration Agreements that cover the southern margin of the Piling group on central Baffin Island for lead-silver-zinc-gold mineralization. During 2002, BHP Billiton flew a 3500-line-km GeoTEM survey. Targets generated from the airborne datasets were mapped and prospected in detail.

Kitikmeot Region

The Kitikmeot region spans the western and northern mainland, and parts of the Victoria, Prince of Wales, King William, and Somerset islands. The Lupin mine is active, having produced over 3.1 million oz of gold since 1982. Mining has been proposed at the nearby Jericho diamond project, which is in the initial stages of regulatory review. The Doris Hinge gold project is also at the feasibility stage and owner Miramar Mining Corp. has begun the regulatory reviews. Diamonds and gold were the two primary commodities sought by companies in the Kitikmeot in 2002. In particular, a staking rush for diamonds in the Coronation Gulf region led to a dramatic increase in grass-roots exploration in that part of the territory.

In August 2001, DIAND committed $3 million towards a feasibility study and associated environmental assessment evaluation to lay the framework for construction of a 295-km all-weather road extending from the Izok Lake zinc-copper deposit to a proposed deep-water port at Bathurst Inlet. The Government of Nunavut and the private sector will contribute a further $1.5 million each. This feasibility study is currently under way. The project will be directed by a Technical Committee consisting of representatives from Kitikmeot Corporation, Inmet Mining, the Inuit-owned Nuna Logistics Corporation, the Community of Kugluktuk, and the Department of Sustainable Development and Department of Community Transportation of the Government of Nunavut. This infrastructure will facilitate access to Inmet's Izok Lake base-metal deposit, which contains a mineable resource of 16.5 Mt grading 11.4% zinc, 2.2% copper, 1.1% lead and 60 g/t silver worth approximately $2 billion. Other known deposits such as Teck Cominco's Hackett River deposit (19.5 Mt grading 5.0% zinc, 0.41% copper, 0.75% lead, 145 g/t silver and 0.45 g/t gold) will also benefit from the road and port. Upon development, the infrastructure is expected to focus future exploration to this region.

BLUE ICE

The Blue Ice diamond project of Diamonds North Resources covers 200 000 acres and straddles the Nunavut/Northwest Territories border. Diamonds North limited its 2002 work to that part of the property within Nunavut, identifying a 20-km-long trending structure, discovering three new kimberlites by drilling and three others by prospecting, and sending kimberlite samples for analysis by caustic fusion.

CROWN, JEWEL, MARQUIS, PRINCESS

Northern Empire Minerals, Stornoway Ventures and Navigator Exploration staked four diamond properties (Crown, Jewel, Marquis and Princess) for a total of 550 000 acres during the winter of 2001/02. Stornoway can earn up to a 70% interest in all four projects from Northern Empire. Navigator has the right to earn a 35% interest from Stornoway on the Jewel project only. Initial exploration on the properties included the collection of approximately 1150 till samples. A large airborne magnetic survey totaling 26 000 line-km was completed across the project area. Six high-priority targets were identified at Princess, 23 at Marquis, 27 at Jewel and 89 at Crown, for a total of 145.

ELU INLET

The Elu base-metals and gold property (Sherwood Mining Corporation) consists of 110 000 acres located northeast of the Hope Bay greenstone belt. In 2002, Sherwood focused its exploration efforts on determining the VMS potential of the Elu belt. It completed ground geophysics and drilled 1755 m in 15 diamond drill holes. Results include: 1.6% zinc, 0.14% lead and 0.09% copper over 1.8 m, and 1.4% zinc, 0.05% lead and 1.3% copper over 0.4 m.

GEORGE LAKE/GOOSE LAKE

Kinross Gold Corporation continued to explore the George Lake and Goose Lake gold deposits by conducting a spring-summer 2002 drill program totaling 5734 m in 26 holes. Drilling was focused on the Goose Lake deposit and significant intersections included 23.68 g/t gold over 5.45 m, 25.77 g/t gold over 4.0 m, and 23.89 g/t gold over 3.7 m. Both the George and Goose Lake deposits are on Subsurface IOL, subject to grandfathered mineral claims and leases. A proposed merger between Kinross Gold Corporation, TVX Gold Inc. and Echo Bay Mines Ltd. was announced and, if approved, would consolidate several significant gold projects in the northern Slave Province, including Goose-George Lakes, Lupin mine and Ulu.

HADLEY BAY

The Hadley Bay diamond property consists of a number of non-contiguous claims in an area of 11 970 km^2. Canabrava Diamond Corporation can earn a 50% interest in this property by spending $5 million and issuing 250 000 shares to Diamonds North Resources over a four-year period. A 13-hole, 1100-m drill program completed during the summer of 2002 encountered five new kimberlites. A cluster of four new bodies, named Apollo, Neptune, Diana and Pluto, were found and a fifth, Juno, was discovered near the King Eider kimberlite. Two holes were completed on King Eider, with three new phases being encountered. A sample was also collected from subcrop of the Turnstone kimberlite for caustic fusion. A 2600-line-km heliborne geophysical survey was completed in late August and early September 2002 over a prospective part of the property.

HIGH LAKE

In 2002, Wolfden Resources completed a $2 million exploration program on the High Lake copper-zinc-gold-silver property. This program consisted of drilling and airborne geophysics. Drilling on the high-grade B zone intersected 5.6% copper and 47.5 g/t silver over 17.45 m. Additional drilling from the D zone includes results of 1.8% copper, 1.9% zinc, 0.5 g/t gold and 45.2 g/t silver over 5.3 m. In July 2002, Wolfden announced an agreement with Teck Cominco Limited whereby Teck-Cominco agreed to subscribe for $1.0 million in Wolfden common shares and provide technical support on High Lake for at least one year. This support includes geological and engineering assistance, geological and geophysical modeling, and metallurgical testing. In exchange, Wolfden agreed not to provide technical information to third parties and Teck-Cominco shall have certain priority rights to the High Lake property during the agreement period.

HOPE BAY

In 2002, the Hope Bay gold project was again the largest exploration project in Nunavut with expenditures of $13 million. Prior to 2002, the Hope Bay project had measured and indicated resources of 3.36 Mt grading 15.4 g/t gold for a total of 1.66 million oz of gold, plus an additional inferred resource of 6.7 Mt grading 12.3 g/t gold, for an additional 2.65 million oz. Miramar Mining Corp. controls most of the Hope Bay greenstone belt (approximately 250 000 acres), large portions of which are Inuit-owned ground administered by Nunavut Tunngavik Incorporated. In 2002, Miramar Mining Corp. and Hope Bay Gold merged, giving Miramar a 100% interest in this project. The company completed 27 831 m of diamond drilling and 2228 m of reverse circulation drilling, and conducted mapping and prospecting. Drilling focused on in-fill drilling of the Doris North area and also tested exploration targets. An updated resource for the Doris Hinge deposit was released in August 2002 and reported 458 000 t at 22.09 g/t gold for a total of 323 900 oz of gold. A feasibility study is expected to be completed by the end of 2002 or early in 2003. Major equipment could be on site by the summer of 2004, allowing production to commence at the end of 2004.

INULIK

The Inulik diamond property consists of 46 claims totaling 90 132 acres. Teck-Cominco can earn up to a 70% interest in the property from Rhonda Corporation by seeing it through to production. In 2002, Rhonda Corporation contracted a 4900-line-km airborne magnetic and EM survey, collected 275 till samples, and identified six kimberlite boulder trains about 10 km southeast of the Knife kimberlite.

JERICHO

According to resource calculations released in September 2000, the Jericho pipe (Tahera Corporation) has an indicated diamond resource of 3.667 Mt grading 1.14 recoverable ct/t at a value of US$83.50/t. Additional inferred resources stand at 3.401 Mt averaging 0.52 ct/t. The feasibility study proposes an eight-year mine life with total production in excess of 3 million ct. Tahera entered the environmental review process in the summer of 2000. A completed Environmental Impact Statement is expected in early 2003 with production possible as early as 2005.

KIKERK LAKE

On the Kikerk Lake diamond property (Ashton Mining of Canada, 52.5%; Caledonia Mining, 17.5%; Northern Empire Minerals Ltd, 30%), an additional 5.83 t of kimberlite was collected from the Potentilla kimberlite in spring 2002. Caustic fusion returned a total of 1.28 ct using a 0.8-mm-square mesh. The largest diamond was a 0.34-ct colourless composite crystal. Although the large stone was considered encouraging, the overall grade was not deemed sufficient for additional work. Drilling of a geophysical anomaly 700 m east of Potentilla produced a new discovery, Stellaria, thought to be a 13-m-wide dyke with a strike length of less than 400 m. Seventy-nine diamonds, 13 larger than 0.5 mm in one dimension, were recovered from 105.4 kg of Stellaria kimberlite. Some 250 till samples were collected in the area with the intention of developing drill targets for 2003.

KIM

The Kim property of Ashton Mining of Canada (89.4%) and Pure Gold Resources (10.6%) is located just west of the Kikerk Lake property. Spring 2002 drilling of the Artemisia kimberlite allowed the collection of 11 t of kimberlite from which 1.176 ct were recovered. The Thrift kimberlite, about 2.5 km southwest of Artemisia, yielded nine microdiamonds from an initial surface sample of 100.8 kg.

LUPIN MINE

Echo Bay Mines Ltd.'s Lupin gold mine reached a milestone in 2001 by pouring its three millionth ounce in May. Lupin is on track to produce 150 000 oz in 2002, having extracted 0.329 Mt grading 8.0 g/t gold in the first half of the year. Cash operating costs were US$223/oz with total production costs (including depreciation, amortization, and ongoing reclamation) equalling US$273/oz. Exploration at the site included a 255-m drift drive on the West zone south of the shaft on the 890-m level. Approximately 2000 m of drilling began testing this portion of the Lupin Ore Unit in September 2002.

MUSKOX

At the Muskox nickel-copper-cobalt-platinum-palladium-gold project, Muskox Minerals Corp. continued to drill test high-priority targets, including the Northern Spears. This target is a 2-km-long conductor within the eastern basal margin of the Muskox intrusion. At least four holes were planned for this target while a 900-line-km airborne magnetic-EM survey was planned over the Keel dyke portion of the intrusion.

ORO

In 2002, Navigator Exploration Corp. focused its exploration work on the Oro gold property on diamond drilling (1429 m in 10 holes). Eight of the holes were designed to test targets on ORO-5 in an attempt to locate possible extensions of the Doris gold deposit, located 3 km along strike to the south. All eight holes intersected altered mafic volcanic rocks and, although no economic grades were encountered, one zone returned 7.1 g/t gold over 30 cm. The two remaining drill holes tested the H4 quartz vein on ORO-2. Drilling confirmed the presence of the vein and anomalous values were encountered across its width (approximately 5.4 m), including 1.99 g/t gold over 0.45 m. Additional exploration on the ORO claims is planned for 2003.

ROCKINGHORSE

The Rockinghorse diamond property is owned by Kennecott Canada Exploration (50%) and Tahera Corporation (50%). Kennecott's 2001 program was highlighted by the discovery of four kimberlites. Sampling of the Anuri and Anuri East bodies resulted in high initial diamond counts; caustic fusion of 656 kg from Anuri yielded 937 diamonds, 337 of them exceeding 0.5 mm in one dimension. A 78-kg sample from Anuri East contained 68 diamonds, of which 18 exceeded 0.5 mm in one dimension. In 2002, Kennecott completed additional drilling of 580 m at Anuri and sent out about 750 kg for caustic fusion. The drilling and geophysical work suggests that Anuri and Anuri East coalesce at depth, and that the kimberlite has high- and low-grade zones within it. The combined body has an estimated resource of 20 Mt to 200 m below surface, with dimensions of 125 m by 280 m. It remains open to the west. A single drill hole of 112 m also resulted in the discovery of the Atani kimberlite.

WELLINGTON

The Wellington diamond property consists of prospecting permits and claims totaling approximately 565 000 acres. Commander Resources, formerly Major General, transferred the property and other diamond interests to Diamonds North Resources in early 2002. Majescor Resources can earn a 50% interest in the property by spending $2.25 million in exploration before the end of 2005. In 2002, Diamonds North and Patrician Diamonds signed a letter of intent whereby Patrician could earn 40% in the property; however, the agreement lapsed during the summer. Majescor subsequently entered into an agreement with Diamonds North and completed helicopter-borne magnetic surveys over two large blocks and 16 isolated anomalies, for a total of 1065 line-km. Several anomalies resembling kimberlites were identified from the preliminary data and will be examined further once final data are received.

3. Canadian Exploration Activity Around the World

3.1 INTRODUCTION

This section provides an overview of Canadian exploration[1] activity abroad. It also highlights the domestic and foreign components of the larger-company exploration market in Canada. The information in this review[2] was current as at July 2002.

3.2 GLOBAL MARKET FOR MINERAL EXPLORATION

In 2001, the value of exploration programs planned around the world by companies of all sizes for precious metals, base metals and diamonds stood at an estimated $3.4 billion (US$2.2 billion), down by more than 10% from the $3.8 billion (US$2.6 billion) planned the previous year.[3] Exploration programs were reduced in about two thirds of the countries and were postponed or abandoned entirely in others. Only in one country, Namibia, was an increase in exploration budgets of more than $10 million expected from 2000 to 2001.

3.3 WORLD'S LARGER COMPANIES

Global trends in mineral exploration are based on data for the world's larger mining companies. These companies are defined here as those with annual exploration budgets of more than $4.6 million in 2001 (constant US$3 million annually). The larger companies are the only ones for which there are consistent data on worldwide exploration activity spanning a period of 10 years. In 2001, 98 companies based around the world each planned to spend more than $4.6 million on exploration. In 2000, 121 companies had planned to spend an equivalent amount; in 1997, the number was 279.

During 2001, the world's larger companies were expected to undertake exploration programs with a combined value of $2.5 billion (US$1.6 billion) in 99 countries, 7 countries fewer than in 2000.

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[1] Most of the information on the larger-company mineral exploration market worldwide is based on *Corporate Exploration Strategies: A Worldwide Analysis*, published annually by the Metals Economics Group (MEG), Halifax, Nova Scotia. MEG counts, as exploration, work from the earliest stage through perimeter drilling, reconnaissance and evaluative forays, as well as work to further quantify and define an identified orebody once the target outline stage has been completed. It also counts as exploration all feasibility work up to the point of a production decision.

[2] Chapter 3 of this report is a summary of an article from the 2001 *Canadian Minerals Yearbook* published by Natural Resources Canada (available on the Internet at www.nrcan.gc.ca/mms/cmy/2001CMY_e.html).

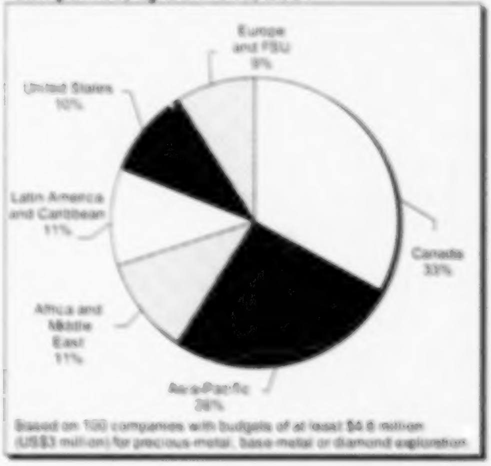
[3] All currencies in this review are expressed in Canadian dollars unless otherwise indicated.

The world's larger mining companies represent only about 15% of the 677 companies of all sizes that were expected to be active in mineral exploration worldwide in 2001. However, the larger companies account for over 80% of the value of all mineral exploration programs carried out around the globe. On a commodity basis, these companies account for almost 90% of the value of programs aimed at base metals and for 80% or more of those aimed at diamonds and gold. On a regional basis, they account for 90% of the programs planned for Latin America; 80% or more of those planned for Africa, Europe and the Former Soviet Union, and Asia-Pacific; and more than 70% of those planned for Canada.

3.4 LARGER CANADIAN-BASED COMPANIES

There are more mineral exploration companies based in Canada than in any other country (**Figure 32**). In spite of generally low prices for mineral commodities in recent years and the difficulty for many companies who have no producing mines to raise capital, 32 Canadian-based companies each planned to spend $4.6 million or more on mineral exploration in 2001. In 2000, there were 48 Canadian-based companies that planned to spend an equivalent amount. In 1996, mining companies listed on Canadian stock exchanges raised a record amount of capital.[4] As a result, 141 Canadian-based companies had each planned to spend, in 1997, the equivalent of $4.6 million on exploration programs around the world. That year, their aggregate budgets for exploration, adjusted for inflation, reached an all-time high value of almost $2.1 billion.

Figure 32
Distribution of the World's Larger Exploration Companies, by Domicile, 2001



Based on 100 companies with budgets of at least $4.6 million (US$3 million) for precious-metal, base-metal or diamond exploration

Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

In 2001, the total value of the exploration programs that the larger Canadian-based companies planned to undertake in both Canada and elsewhere around the world stood at $760 million (**Figure 33**), down by 16% from almost $910 million budgeted in 2000. About two thirds of the decrease from 2000 to 2001 was expected to occur abroad.

The programs that the larger Canadian-based companies planned to undertake during 2001 represent 30% of all larger-company exploration programs for the entire world. Canadians account for the dominant share, by far, of all worldwide mineral exploration activity. Their closest rivals, the Australians, account for 20% while the Europeans account for 15%. In 1997, Canadian programs accounted for a record 35% of the value of all mineral exploration programs planned worldwide.

The larger Canadian-based companies typically budget less individually for exploration programs than the industry average worldwide. In 2001, the larger Canadian-based companies had exploration

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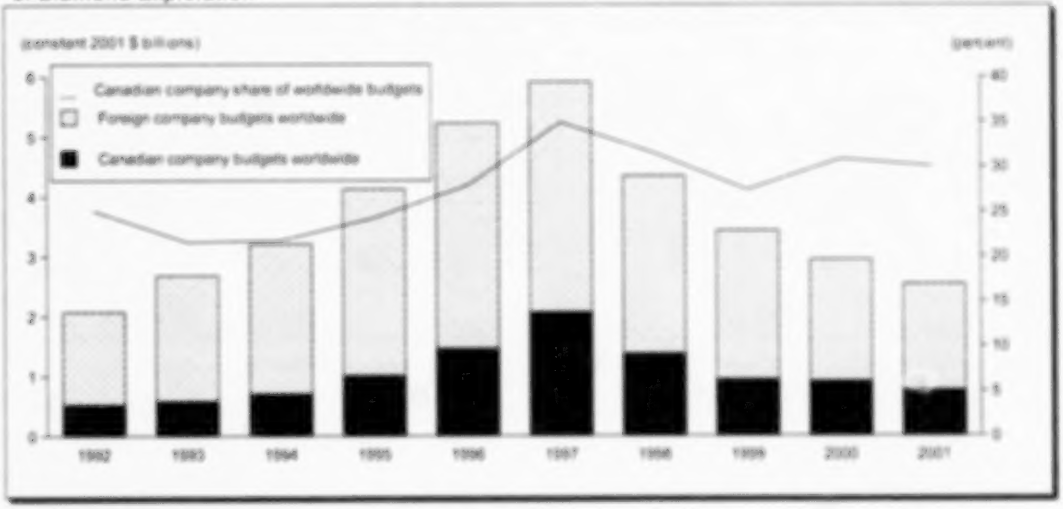
[4] Keith Brewer and André Lemieux, *Canada's Global Position in Mining - Canadian Financing of the International Mining Industry*, Metals Finance 4th International Conference, Toronto, May 7-9, 1997, Natural Resources Canada, Ottawa, 53 pp.

Figure 33

Exploration Budgets of the World's Larger Companies, by Origin, 1992-2001

Companies with Worldwide Budgets of at Least $4.6 Million in 2001 for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.

Notes: The worldwide exploration budgets of companies that intended to spend less than $4.6 million in 2001 (US$3 million) are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

budgets with a mean of $23.7 million and a median of $8.3 million, compared with global averages of $25.8 million and $10.2 million, respectively. In 2001, the mean of the budgets prepared by the larger Canadian-based companies increased by more than $5 million compared with that of the budgets prepared the previous year. This reflects increasing concentration within the larger-company segment of the mining industry.

Although, on a company-by-company basis, there can be a significant variation between budgets and expenditures, aggregate exploration budgets generally provide a reliable estimate of the actual total amount spent in the field worldwide. In the case of the larger Canadian companies, actual expenditures in 1999 were about 7% lower than budgeted, roughly the same departure as observed in the previous year.[5]

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of almost 5700 mineral properties (**Figure 34**) located in Canada or in more than 100 other countries around the world.[6] Most of this portfolio is at the early stages of exploration. The number

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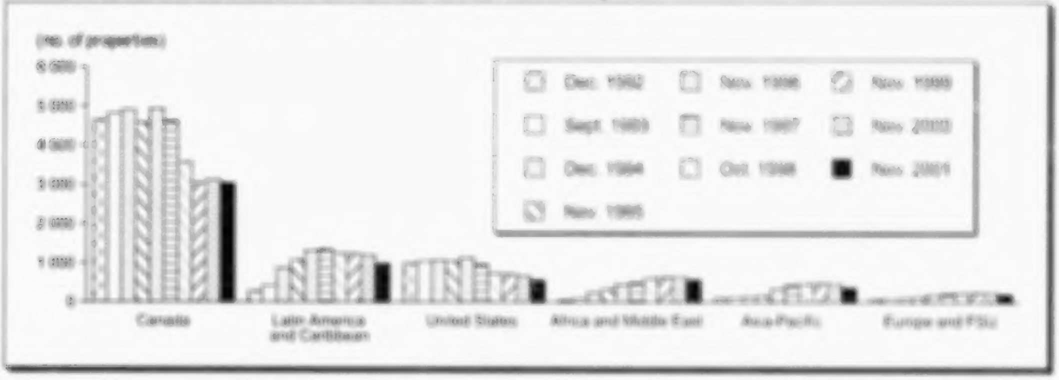
[5] For more information on various aspects of the relationship between exploration budgets and exploration expenditures for the larger Canadian-based companies, see André Lemieux, "Canada's Global Mining Presence," in the 1998 edition of the *Canadian Mineral Yearbook*, Natural Resources Canada, Ottawa, pp. 7.1 and 7.2 (www.nrcan.gc.ca/mms/cmy/content/1998/08.pdf). See also André Lemieux, "Canada's Global Mining Presence," in the 1999 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 7.1 and 7.3 (www.nrcan.gc.ca/mms/cmy/content/1999/08.pdf).

[6] Most of the data for 1991 through 1997 on the mineral property portfolio of companies of all sizes listed on Canadian stock exchanges are derived from MIN-MET CANADA; for 1998 through 2001, they are derived from InfoMine db. These databases are products of Robertson Info-Data Inc. of Vancouver, British Columbia.

Figure 34
Canadian Mineral Property Portfolio Worldwide, by Region, 1992-2001
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on MINMET CANADA for 1992-1997 and InfoMine db for 1998-2001, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.
Note: The decrease in properties in Canada after 1997 is due, in part, to the implementation of database features that make it possible to exclude many inactive properties.

of properties held at the end of 2001 fell by about 600, or roughly 10%, compared with the number held at the end of the previous year. This reflects the difficulty, especially for the smaller companies, in continuing to obtain additional equity financing and the focus by most companies on core assets.

3.5 LARGER-COMPANY EXPLORATION MARKET IN CANADA

In 2001, the larger-company mineral exploration market in Canada was valued at $365 million, down by $45 million, or 12%, from roughly $410 million in 2000 (**Figure 35**). Only in Australia and the United States were aggregate exploration programs expected to experience a larger year-over-year reduction. Canada ranks second, after Australia, in terms of countries where the global mineral exploration industry is the most active. Canada has held that position since 1992. The smaller companies are an important part of the mineral exploration industry in Canada, but their activities are not addressed specifically here.

In 2001, 38 of the world's larger domestic-based or foreign-based companies planned to explore for minerals in Canada, down from 53 in 2000. Nonetheless, more than 14% of the exploration efforts of all of the world's larger companies were expected to take place in Canada in 2001 (**Figure 36**). This proportion is only somewhat larger than in 2000, but it is up from about 11% during each of the previous three years. Prior to the large increase in exploration activity that occurred in developing countries starting in the early 1990s, the proportion of all worldwide exploration activity taking place in Canada stood at 18%.

At the end of 2001, there were more than 3000 mineral properties with recent exploration activity in this country (**Figure 34**).[7]

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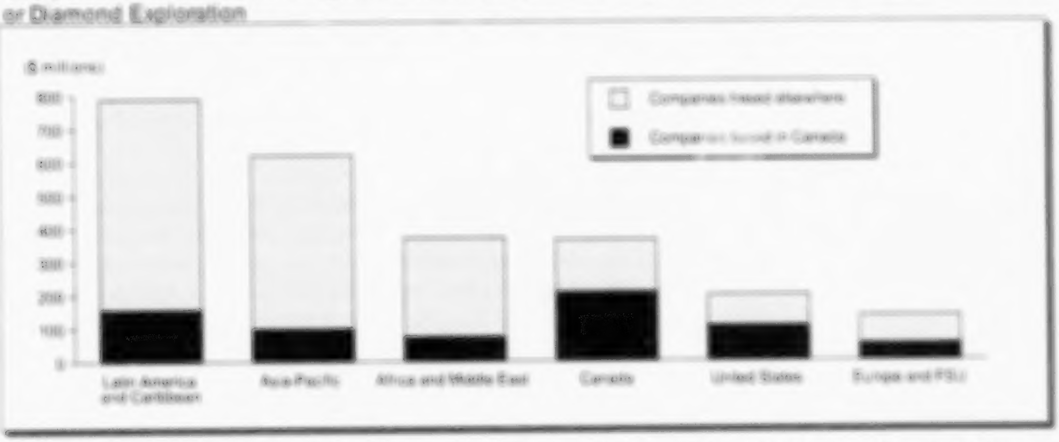
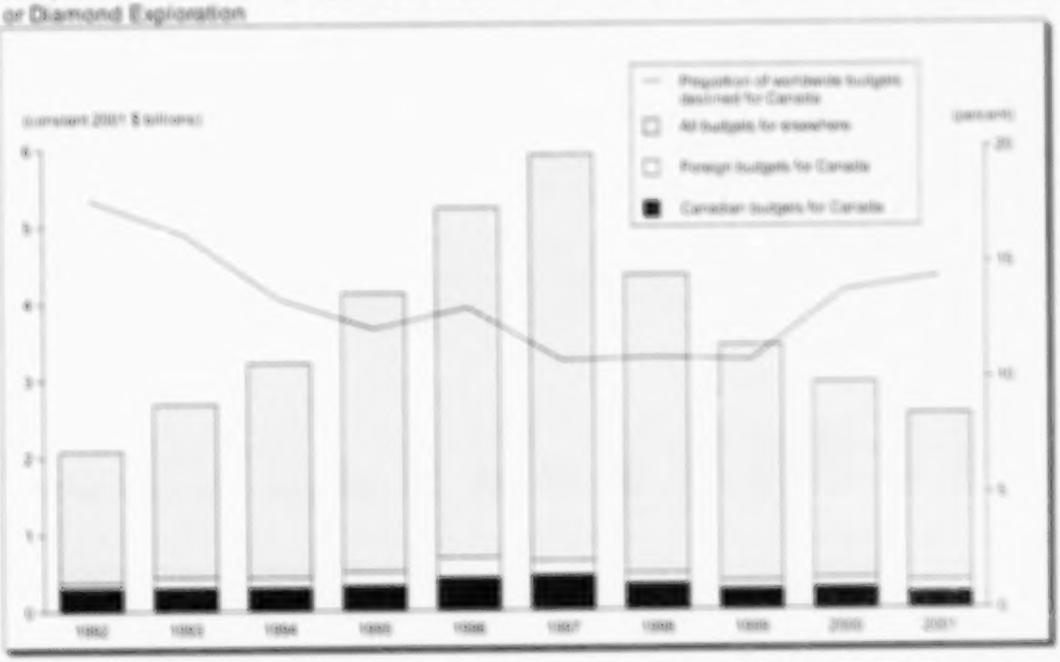
[7] For trends in mineral deposit appraisal activity in Canada over the interval 1982-97, and for a list of projects at the deposit appraisal stage in the late 1990s, see André Lemieux, "Canada's Global Mining Presence," in the 1996 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 8.9 and 8.11-8.22 (www.nrcan.gc.ca/mms/cmy/content/1996/08.pdf).

Figure 35
Exploration Budgets of the World's Larger Companies for Selected Regions of the World, 2001
Companies with Worldwide Budgets of at Least $4.6 Million for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4.6 million in 2001 (US$3 million) are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Figure 36
Exploration Budgets of the World's Larger Companies for Canada and Elsewhere, 1992-2001
Companies with Worldwide Budgets of at Least $4.6 Million in 2001 for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4.6 million in 2001 (US$3 million) are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

3.5.1 Larger Canadian-Based Companies in Canada

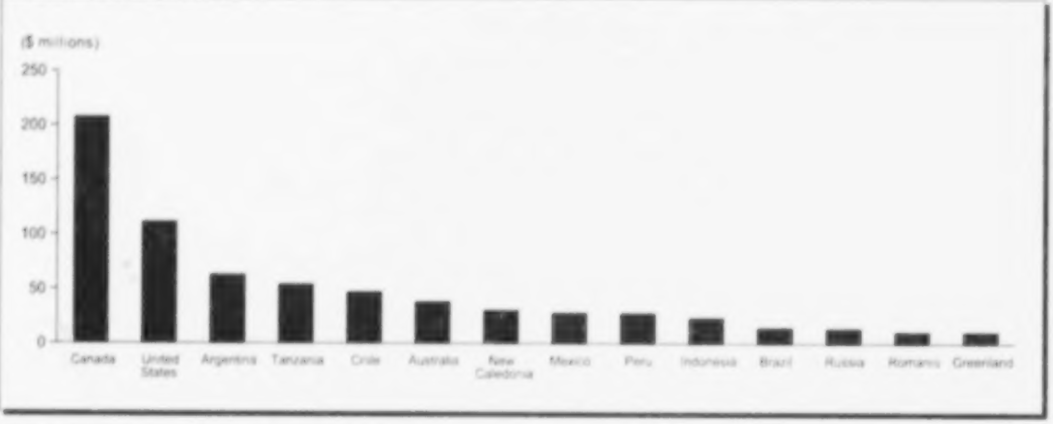
In 2001, 20 of the larger Canadian-based companies allocated, in total, $207 million for exploration in Canada. This amount is down by almost $60 million, or 25%, from the roughly $270 million allocated in 2000.

For the second year in a row, Canadian companies planned to spend more on mineral exploration in Canada than in all of Latin America. From 1995 to 1999, Canadian-based companies spent more in that region of the world than in this country.

The larger Canadian-based companies control 57% of the larger-company mineral exploration market in Canada. The dominance of exploration programs by domestic firms is relatively uncommon. In 2001, the only other countries where domestic companies controlled more than half of the larger-company market for mineral exploration were Sweden (56%), South Africa (66%), Australia (68%) and Japan (100%). That year, the market for mineral exploration was valued at over $400 million in Australia and over $65 million in South Africa, but was valued at less than $20 million in each of Japan and Sweden.

With increasing globalization, the share of the domestic exploration market controlled by Canadian-based companies has fallen gradually as foreign-based companies have increased the amount of exploration that they conduct in this country. In 1992, Canadian-based companies controlled 80% of the larger-company market in Canada but, by 2000, they controlled only two thirds of it. Since the early 1990s, the share of the exploration market controlled by the larger domestic firms has also fallen gradually in the United States and Australia. Still, Canada remains the country where Canadian-based companies spend, by far, the largest proportion of their global mineral exploration budgets (**Figure 37**).

Figure 37
Exploration Budgets of the Larger Canadian-Based Companies, 2001 –
Countries Accounting for 90% of Canadian Budgets
Companies with Worldwide Budgets of at Least $4.6 Million for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4.6 million in 2001 (US$3 million) are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

3.5.2 Foreign-Based Companies in Canada

During 2001, 17 of the larger foreign-based companies planned to spend, in total, almost $160 million on mineral exploration in Canada (**Figure 36**). This represents almost 45% of all activity planned for this country, up from one third in 2000. Compared with the previous year, the budgets of foreign-based companies for Canada increased by more than $30 million.

In 2001, the larger foreign-based companies active in mineral exploration in Canada included: BHP Billiton Limited-BHP Billiton Plc,[8] Normandy Mining Ltd., Pasminco Limited, and WMC Limited, all based in Australia; Echo Bay Mines Ltd., Freeport-McMoRan Copper & Gold Inc., Newmont Mining Corporation, and Phelps Dodge Corporation, all based in the United States; Anglo American plc, Boliden Limited,[9] Outokumpu Oyj, and Rio Tinto plc, all based in Europe; Anglo American Platinum Corporation Limited, AngloGold Limited, the De Beers group, and Impala Platinum Holdings Limited (IMPLATS), all based in South Africa; and the Mexican mining consortium, Grupo Mexico S.A. de C.V.

3.6 LARGER CANADIAN-BASED COMPANIES ABROAD

In 2001, the larger Canadian-based companies planned to spend over $550 million on mineral exploration outside of Canada (**Figure 35**). This amount is down by $70 million, or roughly 10%, from the more than $620 million these companies had planned to spend abroad in 2000.

More than 70% of the worldwide budgets of the larger Canadian-based companies for 2001 were allocated to programs abroad, the same proportion as in 2000. The foreign programs of the larger Canadian-based companies, as a proportion of their domestic and foreign programs combined, peaked at over 78% in 1997. In 1992, that proportion was only about 40%.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of more than 2600 mineral properties located abroad (**Figure 34**), down by roughly 500 properties from the previous year. Foreign properties represent slightly more than half of the total mineral property portfolio held by all companies listed in Canada, up from about 25% in 1992.

Apart from the United States, where companies of all sizes listed on Canadian stock exchanges have a substantial mining presence, about 30 other nations, spread across the globe, account for most of the balance of their mineral property portfolio held abroad (**Figure 38**).

Canadian companies have interests in over 200 mines, smelters, refineries, plants under construction, or projects awaiting the results of a final production feasibility study in roughly 60 foreign countries.[10] They also have hundreds of other projects at the early stages of exploration in these

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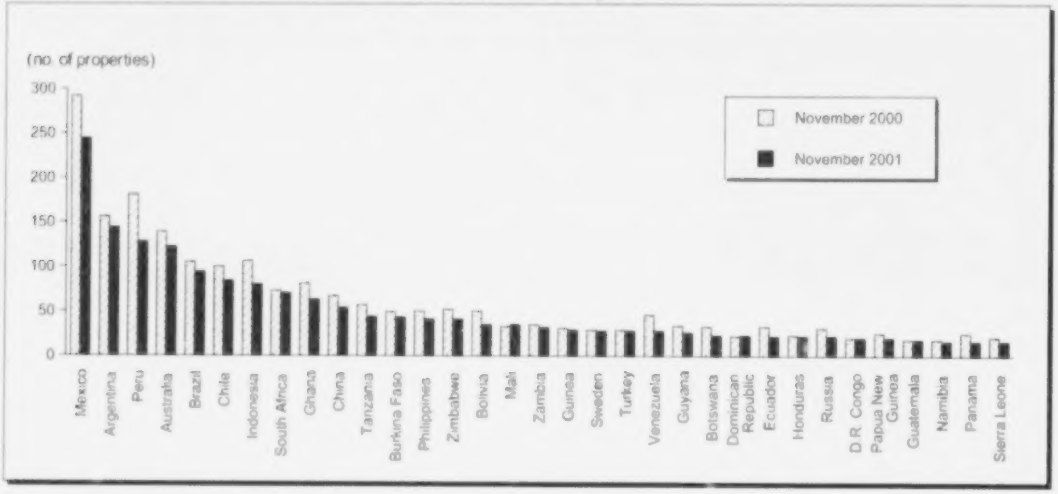
[8] BHP Billiton was formed from the merger, in June 2001, of BHP Limited and Billiton Plc. The company is listed on the London Stock Exchange as BHP Billiton Plc; it is also listed on the Australian Stock Exchange as BHP Billiton Limited. The corporate headquarters of BHP Billiton are located in Melbourne, Australia.

[9] In November 2001, Boliden Limited changed its domicile from Toronto to Stockholm, Sweden. Boliden remains listed on the Toronto Stock Exchange.

[10] For a list of mines, smelters, refineries and other advanced mineral development projects in which companies based in Canada had an interest in mid-2001, see André Lemieux, "Canada's Global Mining Presence," in the 2000 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 7.16-7.19 (www.nrcan.gc.ca/mms/cmy/content/2000/08.pdf).

Figure 38
Canadian Mineral Property Portfolio Abroad, 2000 and 2001 – Countries Accounting for 80% of Canadian Holdings Located Outside the United States in 2001
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on InfoMine db, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

countries and in more than 40 others. The activities of Canadian mining companies in Canada and abroad have fostered the development in this country of over 2200 suppliers of specialized mining goods and services, many of which export their products.[11]

3.6.1 United States

In 2001, the larger-company mineral exploration market in the United States was valued at almost $200 million (**Figure 35**), or about 8% of the $2.5 billion larger-company market worldwide. Larger-company budgets for the United States were down by $120 million compared with those of the previous year. This decrease represents the largest year-over-year reduction in budgets for a single country.

In spite of considerable global retrenchment, 14 of the larger Canadian-based companies planned to spend, in total, over $110 million in the United States, down from $160 million in 2000.

Companies based in most countries considerably reduced their exploration programs for the United States in recent years while those based in Canada increased theirs. As a result, the share of the larger-company exploration market held by Canadian-based companies in the United States has grown to over 55%. Canadian-based companies have increased their share of the exploration market in the United States almost every year since the early 1990s. The United States ranks second after Canada in terms of countries where Canadian companies are the most active in mineral exploration (**Figure 37**).

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[11] For a discussion of the global market for mining goods and services and the role played by Canadian companies, see André Lemieux, *Canadian Suppliers of Mining Goods and Services: Links Between Canadian Mining Companies and Selected Sectors of the Canadian Economy*, Natural Resources Canada, Ottawa, September 2000, 84 pp. (www.nrcan.gc.ca/mms/pdf/minegs_e.pdf).

During 2001, Canadian companies were expected to spend $60 million more than American companies in the United States. U.S. companies have budgeted decreasing amounts for mineral exploration in their country most years since the early 1990s. Although U.S. companies accounted for almost 60% of the value of all exploration programs in their country in 1992, their activities represented only 26% in 2001.

In late 2001, companies of all sizes listed on Canadian stock exchanges held about 550 mineral properties in the United States (**Figure 34**), down by roughly 20% from about 675 at the end of the previous year. In 2000, they had projects located in 22 states, but their efforts were concentrated mainly in the western part of the country in Nevada, Alaska, California, Arizona, Montana, Idaho, Wyoming, Colorado, Washington, Utah and South Dakota.[12] That year, Nevada alone accounted for more than 250 of their mineral properties, or almost 40% of the total Canadian portfolio in the United States.

Although Canadian companies have considerably expanded their activities in Latin America, Africa and Asia since the early 1990s (**Figure 34**), the United States is likely to remain, for the foreseeable future, the foreign country where they hold their largest portfolio of mineral properties. At the end of 2001, the United States accounted for over 20% of all properties held abroad by companies of all sizes listed on Canadian stock exchanges.

3.6.2 Latin America and the Caribbean

In 2001, the larger-company mineral exploration market in Latin America and the Caribbean was valued at $790 million (**Figure 35**), or over 30% of the $2.5 billion larger-company market worldwide. During 2001, the larger Canadian-based companies planned to spend over $190 million in the region, down by $30 million, or 14%, compared with 2000.

After Canada, Latin America is the region of the world where Canadian companies have become the most active in mineral exploration. However, from 1995 to 1999, Canadian companies spent more on mineral exploration in Latin America and the Caribbean than in Canada.

In 2001, Canadian companies held roughly one-quarter of the larger-company market in Latin America and the Caribbean. Canadian budgets stood a close second to those of companies based in the region. The share of the exploration market held by local companies increased to 32% in 2001, up from 29% the previous year; in 1994, local companies held less than 15% of the market in the region.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held interests in about 975 mineral properties in Latin America and the Caribbean, down by roughly 20% from almost 1200 in 2000. Since 1996, the total number of mineral properties held by Canadian companies in the region has exceeded the number held in the United States (**Figure 34**).

3.6.2.1 Mexico

In 2001, the larger-company mineral exploration market in Mexico was valued at $106 million, or 4% of the $2.5 billion larger-company market worldwide. Larger-company budgets for Mexico were almost 20% lower than those of the previous year.

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[12] For a geographic distribution of mineral properties in which Canadian companies have an interest in the United States and in Mexico, see André Lemieux, "Canada's Global Mining Presence," in the 2000 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 7.5 and 7.7 (www.nrcan.gc.ca/mms/cmy/content/2000/08.pdf).

Mexico ranks third in Latin America, and eighth in the world, in terms of countries where Canadian companies are the most active in mineral exploration (**Figure 37**). Only two of the larger Canadian-based companies planned exploration programs in Mexico in 2001. These companies planned to spend, in total, about $30 million there. Nonetheless, the programs of these two companies represent over 20% of the market.

At the end of 2001, companies listed on Canadian stock exchanges held interests in almost 250 properties in Mexico, down from about 300 in 2000.

3.6.2.2 South America

In 2001, the larger-company mineral exploration market in South America was valued at more than $645 million, or over one-quarter of the $2.5 billion larger-company market worldwide. Since the early 1990s, over $5 billion (current U.S. dollars) has been spent by all of the world's mining companies on mineral exploration in South America.

In 2001, fourteen of the larger Canadian-based companies planned to spend, in total, over $155 million in the region. This represents roughly one-quarter of the mineral exploration market there. Canadian companies held the dominant share of the market in both Argentina and Chile.

As a result of the merger of California-based Homestake Mining Company with Toronto-based Barrick,[13] Argentina has become the country of South America where Canadian-based companies budget the most for mineral exploration (**Figure 37**). Argentina also ranks third in the world in terms of countries where Canadian companies are the most active in mineral exploration.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held over 600 mineral properties throughout South America, down from more than 750 at the end of the previous year. They held about 140 properties in Argentina, almost 130 in Peru, more than 75 in each of Brazil and Chile, and over 25 in each of Bolivia, Guyana and Ecuador.

3.6.2.3 Central America

In 2001, the larger-company mineral exploration market in Central America was valued at over $9 million, or less than 1% of the $2.5 billion larger-company market worldwide.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held about 90 mineral properties throughout Central America. They held 15 or more in each of Honduras, Guatemala and Panama.

3.6.2.4 Caribbean

In 2001, the larger-company mineral exploration market in the Caribbean was valued at about $0.3 million, or less than 1% of the $2.5 billion larger-company market worldwide.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held about 40 mineral properties in the Caribbean, most of them in the Dominican Republic and Cuba.

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[13] California-based Homestake Mining Company merged with Toronto-based Barrick Gold Corporation on December 14, 2001. As a result, Barrick Gold Corporation, the successor company, became the second-largest gold producer in the world. The exploration budget of Barrick discussed in this review refers to the combined budgets of the merged companies.

3.6.3 Europe and the Former Soviet Union

In 2001, the larger-company mineral exploration market in Europe and the Former Soviet Union (FSU) was valued at $135 million (**Figure 35**), or slightly more than 5% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies planned to spend almost $50 million in the region, equivalent to roughly 40% of the market.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held almost 200 mineral properties in Europe and the FSU (**Figure 34**).

3.6.3.1 Western Europe

In 2001, the larger-company mineral exploration market in western Europe was valued at almost $65 million, or slightly more than 2% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies planned to spend almost $15 million there, equivalent to more than 20% of the market. Canadians held the dominant share of the market in Greenland and Norway.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held almost 90 mineral properties in western Europe. They held roughly 30 in Sweden, more than 15 in Greenland, and 10 in each of Portugal and Spain.

3.6.3.2 Eastern Europe

In 2001, the larger-company mineral exploration market in eastern Europe was valued at over $28 million, or about 1% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies planned to spend $20 million in eastern Europe, equivalent to almost 70% of the market. Canadian-based companies held the dominant share of the market in Romania and Turkey.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held almost 60 mineral properties in eastern Europe. They held almost 30 in Turkey and over 10 in Slovakia.

3.6.3.3 Former Soviet Union

In 2001, the larger-company mineral exploration market in the countries of the Former Soviet Union (FSU) was valued at almost $37 million,[14] or more than 1% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies planned to spend about $15 million in these countries, about twice as much as in 2000.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held interests in about 50 mineral properties in five countries of the FSU, down from almost 70 at the end of the previous year.

Although Canadian-based companies planned to carry out regional exploration programs in the FSU, Russia is where they planned to undertake most of their exploration programs in 2001. They expected to spend roughly $14 million on exploration in that country, equivalent to over 60% of the market.

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[14] The size of the mineral exploration market in certain regions of the world is probably underestimated because there are few data available on the extent of exploration programs undertaken by some state agencies.

The number of properties held in Russia by companies of all sizes listed on Canadian stock exchanges stands at over 20.

3.6.4 Africa and the Middle East

In 2001, the larger-company mineral exploration market in Africa and the Middle East was valued at more than $370 million (**Figure 35**), or almost 15% of the $2.5 billion larger-company market worldwide. That region of the world is one of the few that did not experience a significant decrease, both in absolute terms and in percentage terms, in exploration activity from 2000 to 2001.

3.6.4.1 Africa

In 2001, the larger-company mineral exploration market in Africa was valued at over $360 million (**Figure 35**), or more than 14% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies planned to spend more than $70 million there, equivalent to almost 20% of the market on that continent.

In 2001, Canadian mineral exploration budgets for Africa increased by $10 million compared with those of the previous year. The larger Canadian-based companies were expected to finance the largest share of the mineral exploration programs planned for Senegal and Tanzania.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held interests in over 550 mineral properties in 39 countries on the African continent. This represents a decrease of about 100 properties since the end of 2000. At the end of 2001, Canadian companies held interests in 50 or more properties in each of South Africa and Ghana.

3.6.4.2 Middle East

In 2001, the larger-company mineral exploration market in the Middle East was valued at $9 million. The larger Canadian-based companies planned to spend $0.2 million there, equivalent to less than 2% of the market in that region.

3.6.5 Asia-Pacific

In 2001, the larger-company mineral exploration market in Asia-Pacific was valued at $620 million (**Figure 35**), or almost one quarter of the $2.5 billion larger-company market worldwide.

Exploration budgets for the region were $140 million less than those proposed in 2000. Activity was expected to be down by over $70 million in Australia, which represents the second largest year-over-year decline for a single country after the one that was expected to occur in the United States. Exploration activity was also expected to be down by $40 million in Papua New Guinea and down by $25 million in Indonesia.

The larger Canadian-based companies planned to spend $114 million in the region, equivalent to over 18% of the market. Their budgets for Asia-Pacific in 2001 were maintained at the same level as in 2000.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held interests in over 350 mineral properties in Asia-Pacific (**Figure 34**), down by over 20% from about 460 at the end of the previous year.

3.6.5.1 Southeast Asia

In 2001, the larger-company mineral exploration market in Southeast Asia was valued at almost $135 million, or slightly more than 5% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies planned to spend $37 million in the region, equivalent to more than one-quarter of the market there.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held over 150 mineral properties in Southeast Asia, down from over 200 at the end of the previous year. They held about 80 properties in Indonesia and more than 40 in the Philippines.

3.6.5.2 East Asia

In 2001, the larger-company mineral exploration market in east Asia, which includes China, Japan, Mongolia and South Korea, was valued at $33 million, or slightly more than 1% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies planned to spend over $9 million in the region, equivalent to roughly 30% of the market.

Since the early 1990s, there has been considerable Canadian interest in the mineral potential of China. In late 2001, companies of all sizes listed on Canadian stock exchanges held interests in about 50 mineral properties in China.

3.6.5.3 South Pacific

In 2001, the larger-company mineral exploration market in the South Pacific was valued at over $440 million, or more than 17% of the $2.5 billion larger-company market worldwide. Australia accounted for over 90% of that market. The larger Canadian-based companies planned to spend almost $68 million in the region.

At the end of 2001, companies of all sizes listed on Canadian stock exchanges held almost 140 properties in the South Pacific, of which over 90% are located in Australia.

3.6.5.4 South Asia

In 2001, the larger-company mineral exploration market in South Asia, which includes India, Pakistan and Sri Lanka, was valued at about $10 million, or less than 1% of the $2.5 billion larger-company market worldwide. The larger Canadian-based companies reported no exploration programs for that region of the world.

3.7 SUMMARY AND OUTLOOK

In 2001, the larger Canadian-based companies planned to conduct, in Canada and elsewhere around the world, mineral exploration programs valued at almost $760 million. Canadians were expected to undertake 30% of the $2.5 billion in exploration programs planned by all of the world's larger companies. The share of the global mineral exploration market controlled by Canadian companies is the largest, by far.

More than 14% of the world's larger-company mineral exploration activity was expected to occur in Canada in 2001, the same proportion as in 2000. Canada ranks second in terms of countries where the world's mineral exploration companies are the most active.

During 2001, and for the second year in a row, Canadians planned to conduct more mineral exploration in Canada than in all of Latin America. Canadian companies planned to conduct the largest share of exploration programs, not only in Canada, but also in the United States, the Caribbean, eastern Europe, and Southeast Asia. Although Canadian companies have diversified their portfolio of mining assets to well over 100 countries, Canada remains the country where they continue to be, by far, the most active.

Mineral commodity prices remain relatively low and this affects the amount of revenue that can be reinvested in mineral exploration. Financing exploration projects for many of the smaller companies continues to be difficult. As a result, many of these smaller companies are inactive. Canadian companies are focussing their efforts on their most promising assets. This is reflected in a 10% decrease in the number of mineral properties held in Canada and abroad from more than 6300 at the end of 2000 to less than 5700 at the end of 2001.

The larger-company exploration market is becoming increasingly concentrated. The number of companies spending the equivalent of US$3 million per year on exploration (C$4.6 million in 2001) has decreased significantly since the late 1990s. In the case of Canadian companies, the number has fallen from an all-time high of 141 in 1997 when financing was readily available to only 32 in 2001.

Globalization of the mining industry is continuing. In Canada, the share of the mineral exploration market controlled by foreign companies has increased from 20% in 1992 to over 40% in 2001. Mergers and acquisitions have become a frequent occurrence in the mining industry. The merger of California-based Homestake with Toronto-based Barrick in late December 2001 propelled Barrick to the rank of second-largest gold producer in the world. Not only did Homestake contribute a significant number of mineral properties to Barrick's portfolio of exploration and producing assets, it also increased Barrick's total Canadian exploration budget worldwide to over $180 million. As a result, Barrick became the company with the largest mineral exploration budget in the world.

Although Canadian companies tend, on average, to have smaller exploration budgets than their competitors, they are considerably more numerous than companies based elsewhere. As a result, Canadians are likely to continue, for the near future at least, to dominate mineral exploration worldwide.

APPENDIX 1

Historical Exploration and Deposit Appraisal Statistics

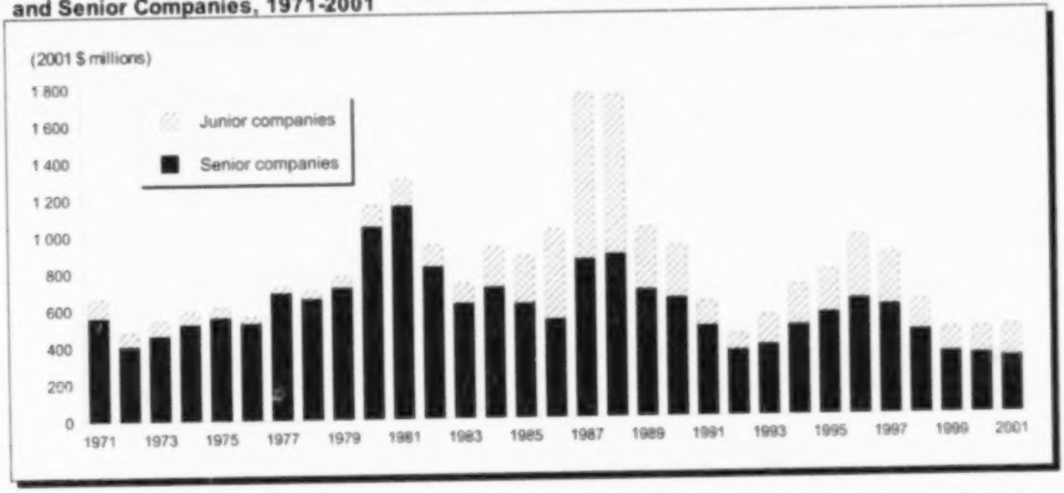
INTRODUCTION

Appendix 1 contains data and analyses that are based on the former survey definitions where only field and overhead costs were considered. While more restricted by this measure of exploration and deposit appraisal activity, the data are available over a much longer time series and provide a statistical basis for studying historical trends.

HISTORICAL SUMMARY

Figure 39 depicts Canadian exploration and deposit appraisal expenditures (field and overhead costs only) in constant 2001 dollars over the period 1971 to 2001. Above-normal expenditures in the 1980-82 period resulted from high prices for gold, silver and copper over much of that period. Spending declined somewhat in 1983, but generally rose from 1984 to 1988 as a result of the introduction by the federal government, in 1983, of the Mining Exploration Depletion Allowance

Figure 39
Exploration and Deposit Appraisal Expenditures[1] (Field Work and Overhead) in Canada by Junior and Senior Companies, 1971-2001



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
[1] Includes on-mine-site and off-mine-site activities.
Notes: Total expenditures for 1975-81 are overstated by an average of about 17% relative to earlier and later years because of changes to the methodology used by Statistics Canada over the years. Data for 2000 and 2001 are final. Expenditures for 1997 to 2001 include both exploration and deposit appraisal costs as per the new survey definitions; up to and including 1996, most of the expenditures now included in the deposit appraisal phase were reported under "exploration," broadly speaking.

(MEDA). MEDA was replaced in 1989 and 1990 by the Canadian Exploration Incentive Program (CEIP). By 1987 and 1988, expenditures had reached unprecedented high levels because of MEDA and the high gold prices that had prevailed until the end of 1987. However, spending fell dramatically after 1988 and decreased until 1992, when it reached its lowest inflation-adjusted level since 1966.

Activity picked up gradually in the 1993-96 period. Expenditures increased by 118% from 1992 to 1996 and the 1996 level of $963 million (2001 dollars) was the highest since 1989. Although exploration and deposit appraisal spending declined somewhat to $872 million (2001 dollars) in 1997, it still remained relatively strong by historical standards. However, spending dropped significantly in 1998 to $615 million (2001 dollars), a decline of 29% from 1997. At $460 million, the 1999 total represents a further drop of 25% from the 1998 level. Final data for 2000 field and overhead costs show almost similar spending of $463 million and 2001 spending was slightly higher at $470 million. Data on field and overhead spending for 2002 were not yet available at the time of publishing this report.

Returning to 1992, the relatively higher expenditure levels that were recorded in ensuing years resulted, to a great extent, from important discoveries of diamond deposits. These discoveries led companies to invest vast sums of money into advanced exploration or deposit appraisal projects and in mine development activities. As indicated in Chapter 1 of this report, over $1 billion has been spent on the search (exploration and deposit appraisal only) for diamonds since 1994.

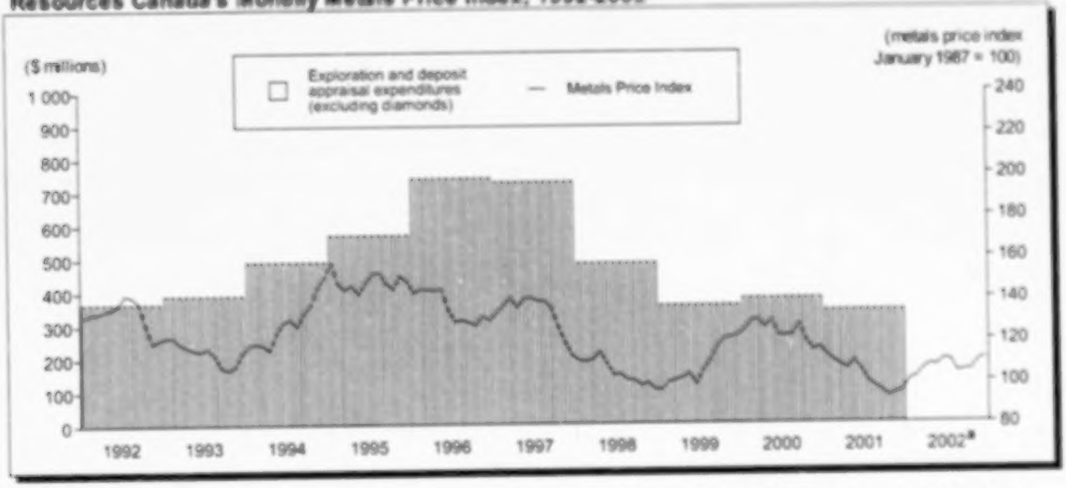
Another major contributor was the late-1994 nickel-copper-cobalt discovery at Voisey's Bay, Labrador, a result of exploration for diamonds in that area, which attracted a lot of attention, especially from junior exploration companies. The resulting flurry of exploration and deposit appraisal activity in the area also had a strong impact on expenditures, particularly in 1995 and 1996.

METAL PRICES AND EXPLORATION AND DEPOSIT APPRAISAL LEVELS

Metal prices are an important factor in determining the level of exploration and deposit appraisal activity. For example, between 1993 and 1995, copper, nickel and lead prices increased by over 60%, while zinc and gold prices increased by 14%. Over the same period, field and overhead exploration and deposit appraisal spending (excluding diamonds-related spending and in current dollars) increased by almost 50%. In early 1995, metal prices embarked on a downward trend as reflected by Natural Resources Canada's monthly Metals Price Index (**Figure 40**). After peaking in January 1995, the index began a generally decreasing trend and had fallen by 39% by January 1999, when it reached its lowest level since at least January 1989. The index generally increased from January 1999 to March 2000 when it was about 35% above the level of January 1999. It then began a downward trend and, in October 2001, generally weak metal prices and the September 2001 terrorist attacks in the United States had brought the index to a new low. Aided by a rising gold price, the index recovered somewhat and stood at a level comparable to early 2001 at the end of 2002, but still far below the ones recorded between 1995 and 1997.

As outlined in Chapter 1, there is a relationship between the level of spending in a particular year and metal prices in earlier years. The decreasing trend in metal prices that began in 1995 was not reflected in spending levels before 1997, partly because of that relationship and partly because of the expenditures on the search for diamonds, which added an element of stability to exploration and deposit appraisal levels. When excluding diamonds, expenditures (field and overhead costs only) peaked in 1996, started declining in 1997, fell even more in 1998 and 1999, recovered somewhat in 2000 and dropped again in 2001. This relationship outlines the importance of improving metal prices in enticing higher exploration and deposit appraisal spending levels.

Figure 40
Exploration and Deposit Appraisal Expenditures (Field Work and Overhead) and Natural Resources Canada's Monthly Metals Price Index, 1992-2002



Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
ªAt press time, no data were available for field and overhead costs in 2002.
Notes: Exploration and deposit appraisal data for 2000 and 2001 are final. For comparison with pre-1997 years, the data include only field and overhead expenditures.

EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES BY JUNIOR COMPANIES

As shown in **Figure 39**, junior companies have traditionally played an important role in Canadian mineral exploration and deposit appraisal activity. However, their contribution really expanded in 1984, a year after the introduction of MEDA, when their spending accounted for almost 24% of total exploration and deposit appraisal expenditures. That proportion had more than doubled by 1987 when junior companies accounted for $901 million (2001 dollars), or 51% of the total of $1.75 billion spent during that year. Junior spending was also very important in 1988 with almost 50% ($862 million) of total expenditures. Their proportion of total spending then started to gradually decrease until it reached 22% in 1992.

The levels of spending recorded by junior companies in the 1986-88 period are even more impressive when taking into account the fact that, during that period, considerable contributions were made by junior companies to joint-venture projects operated by senior companies. These contributions were counted as part of senior companies' spending, thus overstating senior expenditures and understating junior expenditures.

Since 1993, junior spending has represented approximately 30% of total field and overhead expenditures. The discovery of diamonds in Canada's North and of nickel-copper-cobalt at Voisey's Bay were the two most important positive factors affecting junior spending between 1993 and 2001. Low metal prices, a slowing world economy and difficulties in raising financing are at the source of the recent decline in junior expenditures, which rose from $92 million (2001 dollars) in 1992 to $339 million in 1996 and then dropped to $129 million in 1999. At $144 million (2001 dollars), junior company spending began in 2000 what now appears to be a solid upward trend as another $168 million was spent by these companies in 2001. Easier access to financing and a surging gold price helped the junior mining sector in 2002 and these factors are also likely to positively influence their spending plans for 2003.

EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES BY PROVINCE AND TERRITORY

Tables 24 and **25** show exploration and deposit appraisal expenditures (field and overhead costs only) by province and territory in terms of current dollars and 2001 constant dollars. Both tables cover the period 1989 to 2001, which includes the period when MEDA was replaced by CEIP, the difficult period that led to the trough of 1992, the exciting discoveries of 1993 and 1994 and the ensuing increase in spending up to 1996, the downward trend that has brought exploration and deposit appraisal spending down to an almost historical low in 1999, and the relative stabilization of spending in 2000 and 2001.

TABLE 24. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES (FIELD WORK AND OVERHEAD) IN CANADA, BY PROVINCE AND TERRITORY, 1989-2001 (CURRENT DOLLARS)

Province/Territory	Total Exploration and Deposit Appraisal (1)												
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	($ millions)												
Newfoundland and Labrador	36.2	23.3	12.1	11.1	8.9	12.4	71.1	92.5	58.4	40.8	29.3	23.1	20.7
Nova Scotia	21.4	11.0	4.5	3.3	1.8	1.7	2.8	6.9	6.7	4.8	3.6	3.0	1.5
New Brunswick	13.6	16.5	15.8	12.2	11.1	10.0	12.7	14.8	12.2	10.0	10.0	12.0	9.4
Quebec	185.0	186.4	138.1	94.1	106.1	130.3	123.4	137.2	168.6	123.5	103.4	89.9	94.8
Ontario	217.8	152.6	109.7	77.4	75.6	113.0	129.7	194.9	176.5	111.3	81.1	113.7	110.2
Manitoba	37.0	41.2	29.7	32.0	27.4	40.5	32.6	41.2	40.3	29.5	22.6	27.7	28.5
Saskatchewan	63.3	42.2	31.5	25.9	53.1	50.6	43.8	50.6	49.9	57.4	36.0	40.0	34.4
Alberta	6.2	10.7	6.6	5.4	7.3	9.4	10.6	10.8	20.5	21.6	11.4	6.1	4.3
British Columbia	188.6	226.5	135.7	71.6	66.0	85.0	79.4	104.9	95.8	44.3	33.4	29.9	25.6
Yukon	15.1	18.4	16.5	9.7	19.2	25.7	39.3	46.4	40.6	17.5	12.2	9.9	7.9
Northwest Territories	45.7	36.0	31.6	42.7	100.7	149.5	172.2	194.5	150.7	114.8	61.0	45.3	75.2
Nunavut	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	33.8	57.4	58.1
Total field work (excluding overhead)	703.5	680.3	439.2	323.5	410.1	540.5	608.1	635.9	743.5	522.4	387.6	412.2	415.8
Total exploration and deposit appraisal (including overhead)	827.9	774.7	531.8	395.3	477.3	628.1	717.6	894.8	820.2	575.9	437.9	458.1	470.1

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

. . Not available.

(1) For comparison with pre-1997 years, the data include only field and overhead expenditures. They do not include other related expenditures such as those for engineering, environment and land access.

Notes: Data for 2000 and 2001 are final. Numbers may not add to totals due to rounding.

TABLE 25. EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES (FIELD WORK AND OVERHEAD) IN CANADA, BY PROVINCE AND TERRITORY, 1989-2001 (2001 DOLLARS)

Province/Territory	Total Exploration and Deposit Appraisal (1)												
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
							(2001 $ millions)						
Newfoundland and Labrador	44.7	27.9	14.1	12.8	10.1	13.9	77.8	99.6	62.1	43.5	30.8	23.3	20.7
Nova Scotia	26.4	13.2	5.2	3.7	2.0	1.9	3.1	7.4	7.1	5.2	3.8	3.0	1.5
New Brunswick	16.8	19.7	18.4	14.0	12.5	11.2	13.9	15.9	12.9	10.7	10.5	12.2	9.4
Québec	228.4	234.8	160.4	107.9	119.9	145.7	134.9	147.6	179.2	131.9	108.5	90.8	94.8
Ontario	268.9	182.5	127.4	88.8	85.4	128.3	141.9	208.7	187.6	118.8	85.1	114.9	110.2
Manitoba	45.7	49.3	34.5	36.6	31.0	45.3	35.7	44.4	42.8	31.5	23.7	28.0	28.5
Saskatchewan	78.2	50.5	36.6	29.7	60.1	58.5	47.9	54.4	53.1	61.7	37.7	40.4	34.4
Alberta	7.7	12.8	7.7	6.2	8.3	10.5	11.6	11.7	21.8	23.0	12.0	6.2	4.3
British Columbia	230.4	270.8	157.6	82.1	74.6	95.0	88.8	112.8	101.9	47.2	35.0	30.3	25.6
Yukon	18.6	22.0	19.2	11.1	21.7	28.7	43.0	40.9	43.1	18.7	12.8	10.1	7.3
Northwest Territories	56.4	43.0	36.7	49.0	113.9	167.1	188.3	209.3	160.2	122.6	64.0	45.8	75.2
Nunavut	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	35.5	58.0	58.1
Total field work (excluding overhead)	868.5	789.5	510.2	370.9	463.8	604.1	665.1	899.3	796.8	557.5	406.8	416.6	415.8
Total exploration and deposit appraisal (including overhead)	1 022.1	926.3	617.8	441.9	539.7	702.1	784.8	962.7	871.8	614.7	459.5	462.9	470.1

Source: Natural Resources Canada, based on the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

n.a. Not applicable.

(1) For comparison with pre-1997 years, the data include only field and overhead expenditures. They do not include other related expenditures such as those for engineering, environment and land access.

Note: Data for 2000 and 2001 are final. Numbers may not add to totals due to rounding.

APPENDIX 2

Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures

HISTORY OF CANADIAN EXPLORATION STATISTICS

In Canada, mineral exploration statistics have been collected, in one form or another, since 1946. From 1946 to 1963, Statistics Canada compiled "cost of prospecting" data for metal mines for Canada and the provinces. Companies were surveyed from 1964 to 1966, but the data were not compiled. However, using the filled-out survey questionnaires for those three years, Natural Resources Canada (NRCan) was able to estimate expenditures for that period. From 1967 to 1987, Statistics Canada compiled and published both mine-site and general exploration expenditures, as well as mine-site development expenditures and other capital and repair expenditures. From 1985 to 1987, NRCan collected detailed field work expenditures. Since 1988, NRCan has been fully responsible for the survey of non-producing entities that have any type of exploration expenses. Statistics Canada continued to survey producing firms until 1997.

A review of survey definitions was carried out in the mid-1990s to improve the quality of the survey. This revision was undertaken by the Federal-Provincial Committee on Mineral Statistics, in consultation with industry, and completed in 1997. The resulting Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures was designed to better describe the full mineral development cycle (**Table 26**) and to provide more comprehensive measures of investment in the Canadian minerals and metals industry. Statistics from this survey include detailed information on feasibility studies and other more technically related costs that were previously excluded. The redesigned survey also provides a clearer distinction between the primary exploration and deposit appraisal phases, and additional information on associated environmental costs. Since 1997, NRCan has been fully responsible for the coordination of the federal-provincial/territorial preliminary and forecast survey, and partially responsible for the annual survey for both non-producing and producing firms.

SURVEY PROCESS

Two questionnaires are distributed each year. For example, for the survey period 2001/02, the *2001 preliminary estimate* and *2002 intentions* survey was conducted during the last quarter of 2001 and compiled in January 2002. The more detailed *final* survey questionnaires for 2001 were distributed in early 2002. The results of this *final* survey were compiled during the course of 2002. A *revised forecast* survey was also conducted during the course of 2002 by contacting the project operators who had reported spending intentions in the *2001 preliminary estimate* and *2002 intentions* survey as well as those that had failed to do so. The *preliminary estimate* and *intentions* survey usually provides preliminary results on the year in which the survey was conducted and a forecast for the coming year that is based on company spending intentions. The *final* survey provides a wealth of project-specific information, including the type of commodities explored for, the type of field work undertaken, related overhead expenditures, the type of company involved, joint-venture partners, and other details.

TABLE 26. GENERALIZED MODEL OF THE MINERAL RESOURCE DEVELOPMENT AND MINING PROCESS

PHASE	MINERAL RESOURCE ASSESSMENT	MINERAL EXPLORATION					MINERAL DEPOSIT APPRAISAL				MINE COMPLEX DEVELOPMENT	MINE PRODUCTION	ENVIRONMENTAL RESTORATION
		GRASS-ROOTS EXPLORATION											
	MRA	EX-1	EX-2	EX-3	EX-4	EX-5	DA-1	DA-2	DA-3	DA-4	MCD	MP	ER
STAGE	Various surveys, research and synthesis.	Exploration planning	Regional reconnaissance and surveys.	Prospecting and ground surveys of anomalies.	Verification of anomalies and showings	Discovery and delimitation of a mineral deposit	Mineral deposit definition	Project engineering	Project economics	Feasibility study production decision	Mine development, construction of processing plant and infrastructure	Production, marketing and renewal of reserves.	Mine complex closure and decommissioning, site restoration
OBJECTIVES	Supply information and tools required to develop the mineral potential of the nation for economic benefit in the perspective of sustainable development.	Select target commodities. Establish exploration objectives and strategies. Select target areas and sites. Acquire claims or permits if appropriate.	Seek anomalies of interest over wide areas by various survey methods. Select the more promising targets. Acquire claims or permits.	Confirm the presence, exact location and characteristics of anomalies. Acquire claims, leases and properties.	Investigate the cause of anomalies. Find mineral showings. Acquire additional claims, leases and properties.	Discover, delimit and interpret grade, quality and tonnage of a new mineral deposit. Determine if it constitutes a mineral resource of "potential economic interest" to justify more intensive and detailed work.	Define the limits, controls and internal distribution of grades, mineralogy and mineral processing characteristics of the deposit. Acquire all data required for project engineering and cost estimation.	Determine, in an iterative fashion the design, plans, schedules, capital cost and operating cost estimates for all aspects of the project. Establish technical feasibility and costs thoroughly and rea	Obtain all the information required and determine based on corporate objectives parameters for the economic, financial and social-political evaluation of the project.	Diligently validate and integrate project data, interpretations, estimations, plans and evaluations to achieve MCD and production objectives. Decide on whether to undertake the mining project. Obtain permits and financing.	Complete mine development and construction on schedule and within budgets and specifications. Ensure efficient and timely mine complex start-up according to schedule, specifications and cash flow forecasts.	Achieve commercial production on schedule and meet cash flow forecasts and quantity and quality specifications. Achieve mine profitability and company survival in the perspective of sustainable development.	Restore mine site, outside plant and infrastructure to environmentally acceptable condition. Ensure the future quality of the environment.
EVALUATION METHODS	Geoscientific, mineral and economic surveys, research, compilations and synthesis by governments, research institutes, universities and industry.	Metal and mineral market research. Review of geological and ore deposit information and of the legal, fiscal and socio-political context in various areas.	Remote sensing, aerial photography and airborne geophysics. Prospecting, geology and geochemistry. Appraisal, rating and selection of anomalies.	Ground, geological, geochemical and geophysical prospecting and surveys. Compilation, appraisal and selection of significant anomalies.	Geological mapping and other surveys. Trenching, drilling and sampling. Appraisal of results, recommendations for further work, and selection of new tar-	Stripping, trenching, mapping, sampling, drilling and down-hole geophysics. Initial mineral processing tests. Environmental and site surveys. Mineral resource estimation and inventory.	Detailed mapping, sampling and drilling on surface or from underground. Systematic mineralogy and mineral processing tests. Detailed environmental and site surveys. Prefeasibility studies.	Pilot tests, engineering design and planning. Capital and operating costs for mining, mineral processing, infrastructure, environmental protection and restoration. Technical risk analysis. Prefeasibility studies.	Market, prices, product development and financial studies. Environmental, economic, financial, and socio-political risk analysis. Prefeasibility studies.	Exhaustive due diligence review of all data, interpretations, plans and estimates. Evaluation of profitability, given the geological, technical, financial and qualitative risks and the up-side.	Project management methods in a quality assurance perspective. Training program for personnel and detailed start-up plan to meet the requirements of this demanding period.	Production management methods to ensure continuous quality and efficiency improvements. Exploration, deposit appraisal and development of new zones or deposits on-mine-site and off-mine-site.	Mine closure and decommissioning. Environmental restoration and monitoring.
RESULTS	Maps, data bases, tools and models.	Exploration projects	Regional anomalies	Local anomalies.	Mineral showings	Mineral deposit	Deposit appraisal project			Mining project	Mining complex	Mineral production	Restored site
MINERAL INVENTORY	UNDISCOVERED MINERAL POTENTIAL					INFERRED RESOURCE	DELIMITED MINERAL RESOURCE				MINERAL RESERVE		
	SPECULATIVE		HYPOTHETICAL				INDICATED	INDICATED AND MEASURED			PROVEN AND PROBABLE		
ESTIMATION ERROR (targeted margin of error of tonnage/grade estimates at the 90% confidence level)						± 100%	± 50%	Indicated: ± 50 to ± 30% Measured: ± 20 to ± 10% (often several sample grid dimensions are used in each category)			Proven (feasibility: ± 10%; mining: ± 5%)		
INVESTMENTS	Moderate	Low, but increasing multiple investments					Larger and increasing multiple investments				Very large industrial investment		Full compliance
RISK LEVEL	Low	Very high, but decreasing risk of failure and financial loss					High, but decreasing risk of failure				Moderate to low industrial risk		

Sources: Modified by D.A. Cranstone, A. Lemieux and M. Vallée, February 25, 1994, from M. Vallee, 1992, *Guide to the Evaluation of Gold Deposits*, CIM Special Volume 45, p. 4, and *SOQUEM Annual Report*, 1976-77, pp. 4 and 5. Revised by M. Vallee and G. Bouchard, January 2001.

A total of 1670 questionnaires (preliminary and forecast survey) were distributed in September 2001 and 1541 questionnaires were distributed in January 2002 for the final survey. Some companies receive more than one questionnaire depending on the number of provinces/territories in which they are conducting activities. To avoid duplicate reporting, joint-venture participants who are not project operators do not report expenditures on such joint-venture projects. Companies are asked to report expenditures for the calendar year surveyed.

The survey is a full census of all the companies involved in mineral exploration, deposit appraisal and mine complex development in Canada. To protect the confidential data provided by the respondents, only aggregate statistics are released. However, specific information can be added when such information has already entered the public domain.

DEFINITIONS USED IN THE SURVEY

A number of new definitions were introduced in the new survey to more closely reflect the current realities of Canadian mineral exploration and development activities. These definitions were developed and agreed upon by federal, provincial/territorial and industry representatives, and they were tested by companies that volunteered to ensure their relevance and applicability. The following is a summary of the definitions most referred to in this report. For a more comprehensive list of definitions, along with more complete descriptions, the reader is invited to consult the Reporting Guide for the Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Expenditures. This guide is available from Natural Resources Canada or from provincial/territorial survey partners.

Mineral Development Phases (Work Phases)

Exploration expenditures represent all field activities, including capital, repair and maintenance expenditures, carried out (on- or off-mine-site) to search for, discover and carry out the first delineation of a previously unknown mineral deposit to establish its potential economic value (tonnage and grade) and to justify further work.

Deposit appraisal expenditures represent all field activities, as well as capital, repair and maintenance expenditures, carried out (on- or off-mine-site) to bring a delineated deposit to the stage of detailed knowledge required for a feasibility study to justify and support a production decision and the investment required.

Mine complex development expenditures include all mine development, capital (construction, machinery and equipment), repair and maintenance expenditures carried out on a mine property that is in production or committed to production.

Mine development expenditures include all activities carried out on a property that is in production or committed to production to define, block out, and gain access to the ore and prepare it for production. Mine development also includes drilling, rock work and support to extend the current ore reserves.

Location of Activity

On-mine-site expenditures represent all field activities and capital, repair and maintenance expenditures applied to exploration or deposit appraisal for an additional mineral deposit separate from the current mine reserves and located strictly on an existing mine site in production or committed to production.

Off-mine-site expenditures represent all field activities and capital, repair and maintenance expenditures applied to exploration or deposit appraisal that are not located on a mine site that is in production or committed to production. Off-mine-site includes the sites of temporarily or permanently closed mines and advanced projects not yet committed to production.

A *mine site* is an area than can be accessed and exploited from the current or committed installations; hence, the size of this area will vary depending on the commodity under consideration, attitude (horizontal vs. vertical), type and extent of the deposit(s), and the mining method(s) in use.

For a mine site to be *committed to production*, all of the following criteria must be met: (i) a production feasibility study has been completed; (ii) a formal production decision has been reached by the organization; (iii) the necessary financing is on hand or has been arranged; (iv) all required authorizations and permits have been obtained; and (v) major pieces of production equipment have been purchased or ordered.

Surface and Underground Field Surveys and Work (Includes Field Overhead)

Surface and underground field surveys and work includes expenditures associated with geoscientific surveys, drilling, rock work, other field costs, and engineering, economic and feasibility studies. It includes wages, salaries, fringe benefits, food, accommodation and other services, equipment rentals, all vehicle expenses, transportation costs (for people and equipment), and all related technical activities/services such as planning, data collection, interpretation, mapping and reports. The costs incurred by the project operator and contractor(s), as well as field supervision and management costs, are also included. All surveys and work done for environmental purposes are entered under the environment section. This would apply, for example, to geochemical or geophysical surveys performed to characterize or monitor the environment.

Engineering studies include all expenditures related to the additional studies, tests and pilot work (mining, mineral processing, metallurgy, dewatering, etc.), plans, designs and appraisals required to establish the technical feasibility of a mining project.

Economic studies include all expenditures for economic studies (markets, product development, price studies, financing, etc.) required to establish the economic feasibility of a mining project.

Feasibility studies include all expenditures related to prefeasibility project reviews and to the production of feasibility studies required to develop and mine a deposit, and to obtain the required leases, permits and authorizations (excluding environmental and land access expenditures).

Environment-Related Expenditures

Environmental characterization includes all costs of environmental characterization and assessment (including environmental impact studies).

Environmental permits include all costs related to the process of meeting the legal and regulatory requirements or guidelines for environmental assessment and for obtaining permits (including preproduction permits) required for the work program under consideration.

Environmental protection includes costs for monitoring (additional to normal practices) and complying with laws, regulations and guidelines related to air emissions, liquid effluents, ground pollution, and wildlife and habitat protection. Environmental fines, if any, are included in this category.

Environmental restoration includes all costs of decommissioning, reclaiming and restoring, and monitoring, if required, after the completion of exploration and deposit appraisal field work.

Land Access-Related Expenditures

Land access requirements, permits and damages include all costs related to establishing impact and benefit statements, socio-economic agreements, and other requirements for mine complex development and mine production, and the costs of rights of way, damages and permits for exploration and deposit appraisal work, including all associated legal fees, but excluding all environment-related costs.

Capital, Repair and Maintenance Expenditures

Capital expenditures for construction, machinery and equipment include expenditures by the company for work performed by contractors or by the company for its own account, such as salaries and wages, materials and supplies, and other charges such as engineering and consulting fees. Environment-related capital expenditures for protection and site restoration are included in this category.

Non-capitalized *repair and maintenance expenditures* consist of the gross non-capitalized repair expenditures on non-residential buildings, other structures and machinery, the costs of maintaining the restored mine site, and the routine care of assets, including environmental monitoring of the restored mine site.